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VALUE CHAIN ANALYSIS FOR DEVELOPMENT

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Beef value chain analysis in Zimbabwe

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The information and knowledge produced through the value chain studies are intended to support the Delegations of the European Union and their partners in improving policy dialogue, investing in value chains and better understanding the changes linked to their actions

VCA4D uses a systematic methodological framework for analysing value chains in agriculture, livestock, fishery, aquaculture and agroforestry. More information including reports and communication material can be found at: https://europa.eu/capacity4dev/value-chain-analysis-for-development-vca4d-

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Executive summary

Conducted between September 2017 and April 2018, this analysis of the Zimbabwe beef value chain addressed the questions: What is the contribution of the value chain to economic growth? Is the economic growth generated by the value chain inclusive? Is the value chain socially sustainable? and, Is the value chain environmentally sustainable?

The historical background for the Zimbabwe beef value chain is important as it provides context for the current situation. During the colonial and post-colonial period the key objective for the beef sector was intensive commercial farming and exploitation of market access opportunities under the Lome Convention. Following this Zimbabwe underwent a period of intensive land reform with large-scale transfer of farm land from Commercial (white) farmers to small-scale (black) farmers. Somewhere between 161,500 and 300,000 households have resettled on about 4.9 million hectares (Scoones et al, 2010). Commercial farms (white) have declined from 4,000 to about 725. However, various categories of 'new' (black) commercial farms have been developed pre-and post-land reform (11,000+ households). During this period the national disease control system failed and exports ended. Causes of this collapse include: co-habitation of buffalo and cattle; and, un-restrained movement of cattle from high-risk areas. Illegal exports and imports are also reported.

Currently, Zimbabwe aims to reinstate centralised veterinary control to manage transboundary diseases. This has, so far, been unsuccessful with regular outbreaks of food-and-mouth disease occurring, including during the period of this research.

A high proportion of the Zimbabwe population is poor (72.3%) and extremely poor (16.2%). Malnutrition affects 33.8% of children between 6-59 months of age. Rural Zimbabwe is poorer than urban areas by some margin (30.4% of households are extremely poor in rural areas vs 5.6% in urban areas). This drives migration and emigration. Livestock are essential for resilience and coping; cattle holding and maize yields closely correlated. Farms without livestock are the most vulnerable.

Beef consumption is declining: from 13kg to 4 or 6kg per capita reflecting income changes and the availability of cheap chicken meat.

Zimbabwe is a semi-arid country with 85% of the area receiving less than 800mm of rain a year. Resource endowment is high, but distribution skewed and sustainability is questioned by many. Key environmental issues include: land degradation, largely through poor land management; deforestation, through land clearance and fuel use; water scarcity, due to over extraction and urbanisation; pollution of water and air, through mining, urbanisation and intensive agriculture; biodiversity loss, through agricultural expansion and habitat loss; and, climate change and variability, resulting in higher temperatures and lower/variable rainfall.

Operations of the Value Chain

Broadly speaking beef is produced in Zimbabwe under three farming systems (Table 1).

Farming system	Farmer type	Description	No. of households	%	Land area (Ha million)	%	Av Size (Ha)
Fully Communal	Communal	Subsistence mixed farmer with using shared communal grazing and few purchased inputs. Animals for draft power, manure, milk, savings and status.	527,104	75.9	16.4	54.6	31
Partially communal/ commercial	Old resettlement A1 Small A2	A range of relocated farmers using communal grazing and limited intensive production techniques. Animals for both communal and commercial uses including sales.	149,106	21.5	8.9	29.8	60
Fully Commercial	Old small scale commercial Large A2 Commercial	Semi intensive commercial production with supplementary feeding on enclosed land. Animals for sale for commercial gain.	17,700	2.6	4.7	15.6	266
Total			693,910	100	30	100	

TABLE 1: SUMMARY OF ZIMBABWE BEEF FARMING SYSTEMS USED IN THE ANALYSIS

The current beef cattle herd is estimated to be around 5.5 million head (figures are uncertain). The largest proportion of the national beef cattle herd is farmed on a relatively small scale and using a communal farming system, with emerging commercial and fully commercial farmers representing 22% and 6% of the cattle population respectively. An important proportion of communal and partially communal/commercial farmers have no livestock.

In the majority of beef production systems, off-take has declined (reflecting increased risk aversion, increased draft use, need for organic fertilizer, milk use and savings through animal holding), and, average animal size fallen (reflecting a return to more traditional breeds). Average carcass weight of animals slaughtered has declined from 200kg/animal to 167kg/animal as animals are kept longer and traditional breeds increase. Weaning rates have also declined.

Off-take rates are disputed in Zimbabwe, but 11% for commercial and 5% for communal are regularly cited. Challenges facing farmers selling cattle include: high formal and informal levies, duties and rents; and, endemic stock theft. A proportion of the national herd is informally slaughtered, although this figure is in dispute. Production is constrained by these and other systemic issues including: poor access to extension services and advice; lack of resources for basic disease and parasite management; inadequate water supply for cattle in rural areas; and, inadequate animal nutrition, particularly licks and micro-nutrients (especially during the prolonged dry season).

Pre-production actors include input suppliers: feed manufacturers, veterinary medicine sellers/agrodealers, veterinarians/animal health workers and breeders. For the majority of farmers, these actors currently play a somewhat diminished role as few inputs are purchased. Vaccines and dips are the most important. Ratios of animal health workers to cattle owners are very low (e.g., 1 animal health worker to 700 farms in Chiredzi).

Cattle leaving farms is either slaughtered locally for local use or transferred via middlemen or auctions to abattoirs. Traders play an important role in intermediating between abattoirs and farmers. Important recent changes in the abattoir sector include the decline of large scale abattoirs and the growth in 'toll' slaughtering where the abattoir does not take ownership of the animals. It is estimated that 62 medium to large abattoirs slaughter 70-75% of the national herd, but that there are over 160 abattoirs registered. Challenges faced by abattoirs include: throughput, most abattoirs are under-utilised; grading, sellers complain that the old grading system fails to compensate adequately for the reversion of the national beef herd to traditional breeds and carcass weight and quality as declined; utilisation of the 5th quarter, sellers complaining that price does not adequately compensate for this high value element; and, collapse of the hide export and domestic use reducing overall animal slaughter values.

Post slaughter meat is sold to retailers, butchers, caterers and meat processors. Zimbabwe has a small but well-established meat processing sector, largely making sausages, burgers and pies for local sale. Most meat is sold as mixed meat pieces through urban butchers, retail outlets, restaurants and door-to-door meat and meat product traders. Issues in this element of the value chain include: shortages and high costs of imported elements (e.g., packaging and casings), decline of demand from farm workers (although to some extent compensated by the increase of small scale mining operations in the country), and, the threat of informality (risk of under-cutting of formal meat sales by illegal trade with lower food safety standards).

In terms of governance and institutional frameworks, Zimbabwe has a full set of government and non-government bodies. Government structures still reflect the national objective of veterinary control and export orientation.

The Government of Zimbabwe has a National Livestock Development Policy and Programme which aims to support integration of small scale farmers into the formal market chain. Export sales and FMD control are not highlighted in this policy, but are the focus of the proposed "Command Livestock, Fisheries and Wildlife Program". This programme aims to return Zimbabwe to competitive

export. As part of this a National Livestock Identification programme is proposed based on electronic RFID tags.

The functional analysis highlighted 10 value chain dysfunctions (this is not an exhaustive list – neither are these dysfunctions ranked).

- Undervaluation of animal benefits: considering only economic and not social/environmental benefits potentially distorts national policy by over-valuing commercial vs communal production practices.
- Grading practices favour improved animals and commercial farmers.
- Abattoir management practices capture the value of the 5th quarter.
- Traceability is inadequate and promotes illegal trading and theft.
- Prices are not transparent due to the lack of information systems.
- Absence of cash in the economy discourages trade and increases costs.
- Economic uncertainty reduces risk taking and encourages animal retention.
- Informal transaction, rent seeking and direct levies diminish investment and growth in the sector.
- Absence of disease management reduced the overall economic potential of the value chain.
- Drought management is very poor: particularly water access, stocking rates, supplementary feeding and grazing management.

What is the contribution to Economic Growth and is this growth inclusive?

The economic analysis addressed four issues: the financial viability of the value chain, the impact of the value chain on the national economy, the sustainability and viability of the value chain within the global economy and the inclusiveness of growth created by the value chain.

Financial viability. Before assessing the contribution of the value chain to the national economy several macro-economic factors need to be taken into account:

- After a period of relatively low inflation, Zimbabwe is currently seeing quite serious inflationary pressure.
- The economy is experiencing a lack of cash and foreign exchange as well as a range of different values for units of account.
- Considerable evidence of rent seeking was identified in the economy.
- The cost of doing normal business is very high and falls disproportionately on communal farmers who trade livestock
- The threat or promise of government intervention distorts current transactions and future investment decisions

All types of farm (Commercial, Partially Communal/Commercial and Communal) show profitability, particularly where capital costs and family labour are not included. The widely differing business objectives are a key factor. Commercials and Partially Commercial farms are profit oriented, whilst Partially Communal and Communal farms make profits, but aim to address other objectives such as: risk management, savings, social capital, status, milk production, and draft power.

All other actors in the financial analysis show strong profits in the range of 20-40%, particularly abattoirs.

We conclude that the beef value chain is both profitable and financially sustainable.

Impact on the national economy. The consolidated operating account shows that total value added from the beef value chain is US$427,363,320. This represents about 27% of total Agricultural GDP. The rate of integration into the national economy is high (0.87). We conclude from this that the potential for growth and contribution to the economy is also high.

Total value added is mostly generated within the value chain actors demonstrating a high rate integration (0.87) and limited dependence on imports in the sector.

Viability within the global economy._The beef VC has a domestic resource cost ratio of less than 1 (0.15). We conclude that this demonstrates that the value created by the value chain, when measured in international prices, is greater than the domestic resources used in the value chain. This is another indicator of comparative advantage.

The Effective Protection Coefficient (EPC) for the beef value chain is 0.74. This suggests a strong negative incentive for domestic producers over imports..

A Policy Analysis Matrix (PAM) for the beef value chain shows negative capital and labour factor transfers, which can be explained by taxes paid on inputs and services with capital and labour components. We conclude that the value chain has significant potential for trade and that the current policy regime is creating producer disincentives since profitability at market prices is less than profitability at opportunity costs.

Growth inclusiveness. Production and transformation account for 55% of the net income of the beef value chain. This suggests a high level of inclusiveness. Farmers retain 30.82% of the income from the value chain and this to a large extent represents the return to family labour across the different farming models. The element of wages in now relatively small in the beef value chain (11%) showing that the structure of the farming systems have normalised around family, rather than bought labour models.

Trading and processing retain a large proportion of total value chain income (49%). We conclude that a) the abattoir function is pivotal to value chain efficiency and equity, and b) potential exists for improved efficiency/competition in the area of live animal trading.

In conclusion from this analysis, we can conclude from the apparently positive set of economic indicators that a) all actors and the economy as a whole would benefit from sector growth, and, b) integration of new actors, particularly producers, into the value chain would have both financial and economic benefits.

Is the value chain socially sustainable?

The investigation on the social sustainability of the VC chain followed six domains (see Figure 1).

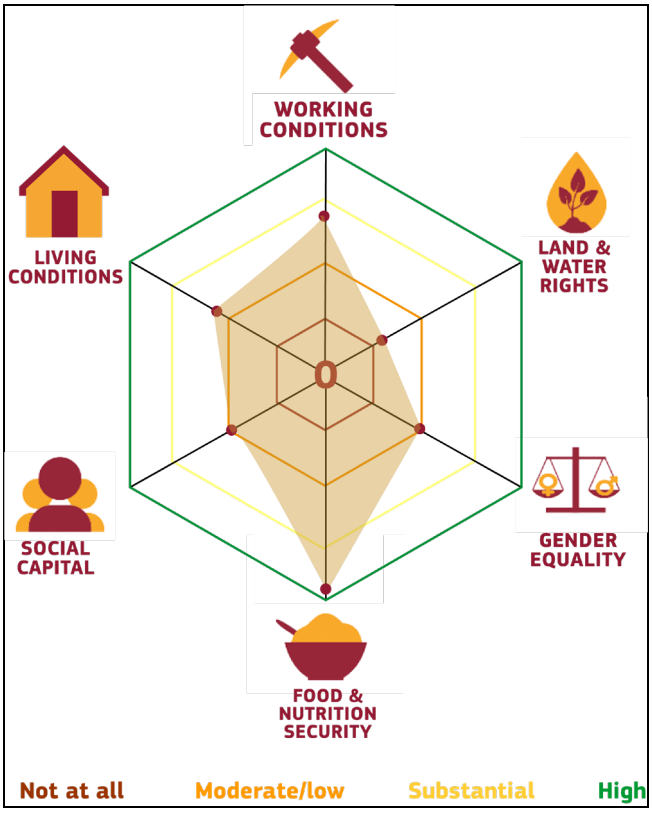


FIGURE 1: SOCIAL PROFILE OF THE ZIMBABWE BEEF VALUE CHAIN
A high score (4) indicates positive conditions and potential social benefits, while a low score (0) indicates drawbacks and potential risks

Land and water access have been transformed by different past and current policies in relation to land reform, parks and wildlife management and territorial control of Foot and Mouth Disease (FMD). Land reform has improved land access for numerous families but lack of title deeds limits potential investments. Proximity to conservancy areas increases the risk of wildlife conflicts and cattle losses. Moreover, the poor conditions of water boreholes, dams and wells amplify the impact of drought periods. Finally, the territorial control of FMD implemented in the past benefited a non-inclusive export-oriented beef sector; the relevance of its re-establishment should be seriously questioned.

Food and nutrition security. Cattle ownership is essential to secure food access on small-scale farms. Cattle provide draft power and manure, and contribute to the production and yield of staple foods. Moreover, cattle ownership contributes to household resilience in case of a shock (climatic, financial…). At the national level, cattle products (meat, milk) are essential to improve the low dietary diversity of the population. At the moment, there is strong competition with the more affordable chicken meat. However, as the environmental impacts of extensive cattle production are low (and probably much lower than those of the poultry VC), the development of the beef VC chain should be considered as a priority to improve national meat availability.

Social capital and information. Despite important problems in securing beef supplies, the abattoirs are the most influential stakeholders in the VC. The whole VC is characterized by a lack of trustworthy relations. Farmers are poorly organized and represented in decision bodies. Nevertheless, they have been able to resist different successive policies that have ignored the

complex role of cattle in rural livelihoods. They have proven their capacity to equip the farms resulting from the fast track land reform with draft power, to occupy part of the economic space released by the dismantlement of large scale farms, and to adapt to a highly uncertain context. Securing farmers' legal and financial environment would be a more effective means to encouraging farmers' greater involvement in the beef VC, than "changing farmers' mentality", a remark that is often heard.

Living conditions. Despite slow improvement, living conditions in Zimbabwe are poor. Issues related to living conditions (access to health services, sanitation, water and electricity) are not specific to the beef VC. Nevertheless, there is a direct relationship between cattle and education since paying school fees is one of the main functions of cattle ownership. Moreover, labour mobility to neighbouring countries also has a positive impact since remittances are often used to invest in cattle when the migrants return. The study of the living conditions of populations located near large-scale abattoirs should receive more attention in relation to waste management.

Gender equality. Cattle ownership and management is traditionally a male activity, except for milking and manure valorisation. Women have limited access to the main means of building up a cattle herd (herding, migration). Consequently, access to draft power for heavy work may be a concern in female-headed households. At farm level, there is apparently no competition between male cattle and female livestock (i.e., goats, chicken). At a larger scale, livestock extension services are currently very focused on cattle to the detriment of female-owned livestock. The other stages of the beef VC (slaughterhouse, feeding companies) mainly offer employment to men. Nevertheless, cattle-related projects conducted by NGOs help to reduce this discrimination since the inclusion of women is one of their priorities.

Working conditions. Most of the people engaged in cattle related activities are self-employed farmers and their families. Cattle ownership facilitates farm work (ploughing, transport...) and increases work productivity. Children as family members are involved in herding and milking activities but this does not affect school attendance. For employed workers, the working conditions are relatively good compared to other production sectors (e.g., sugar cane plantations). In large-scale abattoirs, workers benefit indirectly from a strong legislative framework in relation to occupational health and safety. One concern is related to the suspension of work and wages when the functioning of the beef VC is interrupted (e.g., in the case of a disease outbreak). Another concern relates to workers in drugs companies: they are exposed to chemicals with no systematic protection.

In conclusion for the social analysis, the value chain is more inclusive than it was in the past. But, in the present context (cattle farmers with low bargaining power; lack of stakeholders' consultation; current policies and discourses contributing to discredit cattle multi-functionality and farmers' rationalities), non-intervention could jeopardize this inclusiveness. There is a risk that the multifunctionality of cattle at farms level might be jeopardized by some national policies highly focused on beef as a commodity. Extension services directed to livestock are highly focused on cattle and health issues. Means are lacking (in particular for the functioning of the dip tanks) and high attention is given to FMD control. There is a strong risk that investments in the restoration of a FMD fence will be made without taking into account the "new" land use and users (compared to the

period before the land reform). It could contribute to restore a dualistic animal farming system with limited inclusiveness. The development of the value chain beef VC could bring competition to female livestock activities (small ruminants, poultry). Without external support it is likely that women will not participate and could be side-lined from decisions that might impact their activities.

Is the value chain environmentally sustainable?

Answering the question "is the Zimbabwean VC sustainable?" is difficult because LCA indicators are not binary. There are no threshold values for the different areas of protection that enable us to say if the VC is or not sustainable. A way to answer this question may be to compare obtained values with other references.

Human Health damage. LCA studies present Midpoint indicators such as Global Warming Potential (GWP = Climate change) in kg CO2-eq and conclude GHG emissions for beef production could range from around 15 to 75 kg eqCO2 per kg equivalent carcass. Considering this range, we can consider GHG emissions from Zimbabwean beef production systems are low. As a consequence and as the global warming is the main contributor to damage on Human Health from Zimbabwean beef VC, we can consider the VC have low impacts on this area of protection.

Impacts on Ecosystem quality. The main contributor of beef to ecosystem quality is land use, mainly due to large natural pasture area used by communal production systems. Unsustainability of this land use can be discussed. LCA in Endpoint ReCiPe 2016 method focused on two different types of land use: transformation (land use change) in which transformation refers to changing one kind of land cover to another, and occupation (land use) which refers to the use of a land cover for a certain period. Incorporating both types of land use in an assessment is important for full analysis, but considerable difficulties persist in the interpretation and combination of the two classes (Mattila et al., 2011). As such, areas are natural, our assessment refers to occupation. However, unsustainability of this land use can be questioned. Firstly, valorization of these areas does not compete with other uses, as human food production for instance. Moreover, management of the natural pasture areas by communal farmers is extensive with low animal density. Sustainability of such management (overgrazing for instance) have not been assessed but, from interviews and as they represent their only feeding resources, communal areas management by farmers tend to be sustainable. Paradoxically, natural pasture areas management by commercial and commercial / communal farmers through fencing, both for veterinary control (e.g., veterinary cordons) and land appropriation, is more questionable. As demonstrated in South Africa, fences could be unselective and can create substantial physical barriers for many wildlife species (Gadd, 2012). The ecological cost of fencing is not considered in the LCA framework although it could represent a major burden in Zimbabwe.

Contribution to resource depletion. The main contribution to resource depletion is fossil energy use. Fossil energy use from cradle-to-market reached 5.8MJ per kg eq carcass. In literature, values for cradle-to-farm gate beef studies can range from 5 in Brazilian context (Cederberg et al., 2009) to more than 30MJ.kg in Europe (Williams et al., 2006; Veysset et al., 2010) or still United States (Rotz et al., 2015). We could conclude that Zimbabwean beef VC is sustainable concerning Resources depletion.

In conclusion from the environmental analysis, and regarding the indicators calculated, the impacts of Zimbabwean beef VC seem to be low compared to a large part of beef VC investigated around the world. However, these low impacts are partly related to extensive and low-input management of communal production systems for different reasons. Firstly, they present lower

impacts on the different areas of protection with the exception of ecosystem quality. Secondly, they represent close to 60% of carcasses produced yearly. Finally, because carcasses from communal farmers are mainly sent in a direct sub-VC with only rural butchers as intermediate actors.

Dynamics of the development of the VC

To collate the results of the various value chain analysis the Team has applied two synoptic tools, a risk analysis matrix and a Strength, Weakness, Opportunities and Threats (SWOT) matrix (see Table 2 and Figure 2).

Risk category	Comments	Relevant indicators	Probability	Severity
Price trends	Inflationary pressure in Zimbabwe is currently very high	Retail Price Index (%)	High	High
Price volatility	Potential for over and under supply caused by climate variability	Total animal slaughter (heads/year)	High	Medium
Logistics and infrastructure	Domestic infrastructure good but in decline		Medium	Medium
Policies	Command livestock distorts domestic beef economy	Ratio of beef sales price per hear vs border parity price	Medium	High
Social relations	Reduced livestock ownership in rural areas increases vulnerability and reduced resilience	No. of households with >5 head cattle	Medium	High
Food safety and phytosanitary situation	Unregulated veterinary disease	No. of outbreaks (tick borne diseases, FMD) incidents reported per year	High	Medium
Weather and climate change	Increased average temperature, reduced and variable rainfall	Rainfall and temperature statistics	High	High
Natural environment	Land degradation, pollution, forest clearance, water resources depletion, GHG emissions	Agricultural land occupation (ha), deforestation rates (ha/yr), water depletion (water use / water resources depletion), Annual livestock sector GHG emissions assessment	Medium	Medium

TABLE 2: RISK ANALYSIS MATRIX FOR THE ZIMBABWE BEEF VALUE CHAIN

	Positive	Negative
Internal	Strengths: • Comparative advantage in beef production • Existing infrastructure • Low environmental impacts due to extensive management • Cattle ownership and livestock management is an important source of climate resilience against the negative impacts of climate shock, particularly for communal farming systems	Weaknesses: • Inadequate access to capital • Infrastructure mainly in former commercial areas • Low level of cattle producers' organisations • Failure to control animal diseases with high mortality threatens cattle productivity •
External	Opportunities: • High potential for intensification • Processing and export of beef and beef products (hides) • Strong potential for vertical integration	Threats: • Failure to control trans-boundary disease threatens trade • Wildlife predation • Alternative cheap animal protein (chicken) • Continued economic uncertainty discourages investment • Low consumers' purchasing power

FIGURE 2: SWOT ANALYSIS OF THE ZIMBABWE BEEF VALUE CHAIN

Recommendations

The Team offers specific recommendations related to each section (economic, social and environmental) and cross cutting recommendations

Economic

A few relatively simple actions would have great benefit for the economic impact and particularly the inclusiveness of the beef value chain. Systematically adjusting the beef sector policies and its support mechanisms to reflect the majority of beef farmers (e.g., communal farmers) would be the recommended departure point. General economic stability and access to cash are crucial for the continued functioning of the sector. It is the view of the Team that increasing the tax burden on small-scale and emerging commercial farmers stymies investment and reduced inclusion.

Cattle ownership. Most farmers do not have access to cattle and therefore are vulnerable to economic and environmental shocks. Schemes promoting wider cattle ownership should be encouraged.

Marketing structure. The value chain as analysed by the Team currently reflects a historic structure aimed at: a) maintaining control of veterinary disease: and, b) focussed on off-take from commercial beef cattle ranches to feed preferential exports. While structural change is occurring (e.g., more and smaller abattoirs are opening), this could be more managed and policies weighted to encourage greater inclusion of indigenous small-scale production norms.

Economic growth and exports. The analysis demonstrates comparative advantage for Zimbabwe in beef production. However, other factors, including economic inclusion, suggest that a traditional approach to managing veterinary disease to promote market access will benefit few but be paid for by all. Naturally, there is a strong compulsion to return to exports in Zimbabwe. If this is the driver for economic growth, then we recommend an emphasis on alternative market access mechanisms including, for example, Commodity Based Trade (CBT) although we note that this in itself will not guarantee uptake of Zimbabwe's beef in overseas markets.

Infrastructure. This analysis says little about the role of nationally acquired infrastructure in the growth and inclusiveness of the beef value chain. It is worth mentioning that key infrastructure can promote growth in productivity and inclusiveness. For example, access to water for animals, dip tanks for pest management, farm-to-market roads etc. We recommend improving the beef cattle infrastructure in line with the objectives to increase cattle ownership and improve productivity among communal and communal/commercial beef farmers.

Social

Very general measures would benefit the social sustainability of the beef VC. These include: improved enforcement of international standards on labour rights, land and water rights, and elimination of discrimination against women. In relation to issues more specific to the beef value chain, the following key mitigation measures could be implemented:

Stakeholder's organizations. The low bargaining power of farmers could be addressed by supporting cattle producers' associations, at local and national level. Incentives should be given for the setup of a cattle producers' association inside the LMAC (Livestock and Meat Advisory Council), representing their diversity. This could contribute to a more fair relationship in the beef VC, in regards with topics such as payment of the revision of the grading system, the control of tax rises and of their use. Strengthening the workers' committees in the companies (abattoirs, vet drugs and feed companies...) should also be an objective.

Extension services. There a need to support extension services and livestock policies that can embrace a diversity of 1) species (not only cattle but also women' livestock, i.e. goats and poultry), 2) thematic (not only health but also feeding practices for example), 3) diseases (not only FMD but also diseases with high mortality rate), and 4) disease control strategies (not only zoning and exclusion, but also alternatives strategies to manage FMD: vaccination, Commodity Based Trade, animal tracking system. Market information systems could be set up for farmers and based on the network of dip tanks.

Gender. Rural women should be supported to participate in the beef value chain (e.g. in acquiring cattle) and in the process of decision-making. The composition of the Livestock Development Committees could aim at a proportional representation of women registered in these committees (i.e. female "stock card holders")

At the present, donors' interventions mainly focus on communal farms. But there is a need to include the other types of farms and in particular the ones in the areas of resettlement. In these areas, projects could support mechanisms for land dispute resolution, land securitization, water points' rehabilitation and so on. This will also allow taking into account the complementarities

(present and potential) between these farms (including large scale farms) in the functioning of the beef value chain.

Environmental

Ecosystem impacts. We note that widely differing environmental impacts of communal and commercial production systems. Deeper understanding of the relationships between different and competing land uses and their environmental impacts is needed to promote discourse in Zimbabwe. We would recommend supporting the analysis of different and emerging beef farming systems in greater detail from an environmental impact perspective. This should include the issue of the environmental impacts of enclosure (e.g. fencing).

Water use. We feel that not enough is known about water deprivation in cattle producing areas of Zimbabwe and recommend that this knowledge gap be filled, particularly in the light of the drive for increased cattle ownership and the expected impacts of climate change.

The cross- cutting recommendations

- Deepening the knowledge on the VC by filling in important information gaps, e.g. technological or management diagnosis at a specific stage of the chain;

Whilst the Zimbabwe beef VCA has been fairly comprehensive, it is based on a rather weak national animal production data set, particularly for communal farming systems and for households without animals. Greater knowledge of these two groups would strengthen the inclusiveness of future policy decisions.

- Enhancing the development of the VC;

Development of the beef value chain is at an important crossroads. The analysis suggests that investment in measures to enhance market access can release significant comparative advantage. However, the inclusiveness of this approach is questionable. The risk is that, by investing resources in veterinary control, those (in the great majority) who either have few animals which are un-traded or who have no animals (but wish to own animals) will effectively pay the cost of market access by transfer from one sector to another.

We would, therefore, strongly recommend a development of the sector that aims a) to be inclusive, b) to encourage an increase in the number of emerging commercial producers, and, c) promotes livestock ownership and a means for non-owning households to generate income and increase resilience. A nuanced beef sector development strategy will be needed to prevent rent seeking and unexpected negative impacts from transfers from one group to another.

- Avoiding major risks (as identified in the risk analysis);

The potential for downside risk is high in the beef value chain. We particularly note that Zimbabwe is highly likely to suffer the negative impacts of climate change. Cattle ownership and livestock management in general is an important source of climate resilience against the negative impacts of climate shock, particularly for communal farming systems. Moreover, moving towards more

intensified production systems as commercial farms could not be without increasing environmental impacts especially on resources depletion (fossil and water) and GHG emissions.

Economic uncertainty is an important and, currently, highly likely risk for the beef sector. Ownership of cattle as a hedge against such uncertainty is a strong driver of reduced off-take.

At the moment, the risk that uncertain policies might negatively impact on a high proportion of the beef value chain is present. We recommend that careful analysis is conducted (possibly using the AFA methodology) to ascertain the potential impacts of policies before they are implemented.

- Possible follow-up work to be undertaken within the framework of the Agrinatura partnership.

The Zimbabwe beef value chain analysis provides an empirical tool and measure against which future investments in the sector can be measured. We strongly recommend that the analysis be re-done after a period of time to assess the impact of policies and investments.

1. INTRODUCTION AND CONTEXT

1.1 Introduction

This report provides an analysis of the beef value chain in Zimbabwe. This study is part of a larger effort entitles "Value Chain Analysis for Development" (VC4AD) funded by the European Commission's Directorate-General for International Cooperation and Development (DG DEVCO) and is part of the European Union's "Inclusive and Sustainable Value Chains and Food Fortification Programme". The study of the beef value chain in Zimbabwe is one of a number of similar single country and single commodity base studies intended to support the European Commission and National Governments to frame their policy discourse around strategic issues that constrain the growth of the identified sectors and their contributions to sustainable development.

The objective of the study is to produce knowledge about the growth, inclusiveness and sustainability of the Beef Value Chain (VC) in Zimbabwe. In this context, the expert team orientated their analysis along the following four leading questions: 1) what is the contribution of the VC to economic growth? 2) Is this economic growth inclusive? 3) Is this VC socially sustainable? 4) Is the VC environmentally sustainable?

The study was implemented over a period of 6 months, between October 2017 and March 2018. The study team consisted of the following team members:

- Prof. Ben Bennett, Team Leader and Economist, Natural Resources Institute, University of Greenwich, United Kingdom;
- Charles Chakoma, National Expert, Harare, Zimbabwe;
- Dr. Mathieu Vigne, Environmental/Life Cycle Analysis Expert, CIRAD, France;
- Dr. Muriel Figuié, Social Development Expert, CIRAD, France
- Dr Pamela Katic, Quantitative Modeling Expert, NRI.

The study consisted of the following phases:

- Brussels: Briefing 28-29 September 2017
- 1st round of fieldwork 15-28 October 2017 (full team)
- 2nd round of fieldwork:
    a) 21 January-1 February 2018 (Prof Bennett); and,
    b) 7-16 February 2018 (Dr Figuié).
- Analysis and report writing.
- Presentation of findings.

An itinerary and list of people met can be found at Annex 1. A comprehensive list of references and acronyms are at Annex 2 and 3 respectively.

1.2 Context

At the time of the study, Zimbabwe was undergoing important political changes. The transfer of power from former President Mugabe after 37 years in late November 2017 is an important moment for the country. It is as yet uncertain how this might impact on key national policies, including agriculture and livestock development. At the time of the field work for this study, Zimbabwe was

undergoing severe economic challenges including absence of foreign exchange and a shortage of cash in the country. This context may impact on the study findings.

1.3 Scope

Following the initial field visit in October 2017, the Team elected to limit the analysis to three key farming systems (described below) and one 'typical' abattoir model[1]. On the one hand, this decision was made to limit the level of complexity in the system whilst on the other hand recognizing that the great majority (e.g., more than 80%) of beef entering the market in Zimbabwe passes through a set of actors that can be narrowly defined. This definition of scope is summarized in Figure 3. The functional analysis will describe this in detail.

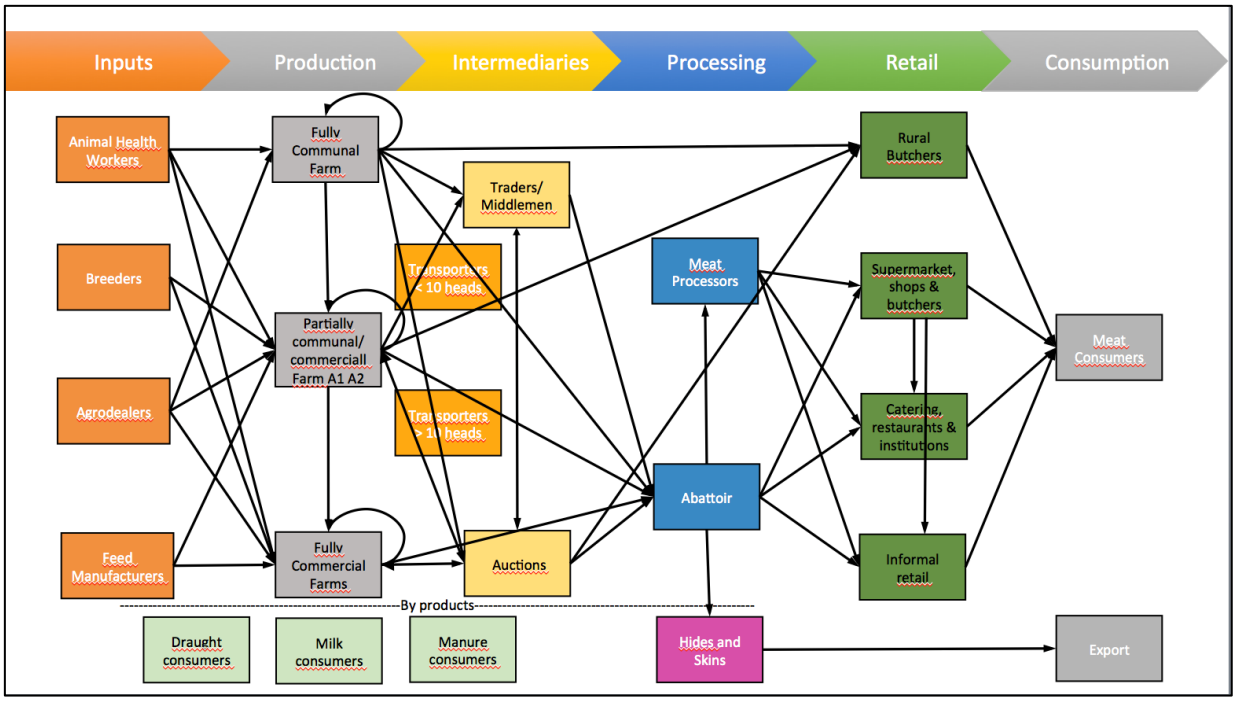


FIGURE 3: FUNCTIONAL ANALYSIS OF THE ZIMBABWE BEEF VALUE CHAIN

1.4 Method

The method used in this study aims to provide evidence, supported by a list of indicators measured quantitatively or based on expert assessments that together provide an answer to four framing questions:

1. What is the contribution of the VC to economic growth?
2. Is this economic growth inclusive?
3. Is the VC socially sustainable?
4. Is the VC environmentally sustainable?

The four components of the analytical process can be summarised as follows:

[1] More detail of the different abattoir models can be found under the Technical Diagnosis below

Functional analysis: provides a general mapping and description of the main actors, activities, and operations in the chain, an overview of the products and product flows, the major production systems, a description of the main governance mechanisms in the chain, and a short description of (known) constraints. The functional analysis forms the basis for the analyses in the other three components. The analysis is mainly based on secondary data, and key informant interviews with both value chain actors and key experts.

Economic analysis: firstly consists of a financial analysis of each actor type identified in the functional analysis (financial accounts, return on investment), as well as an assessment of the consolidated value chain (total value of production, global operating accounts). Secondly, it assesses the economic performance (contribution to economic growth in terms of direct and indirect value added generated, and the sustainability/viability for the national economy (domestic cost ratio, policy analysis matrix). Finally, it addresses inclusiveness of growth by examining income distribution (business income, wages), and employment creation and distribution. A challenge facing the economic analysis of beef in Zimbabwe is the availability and quality of data. Limited national agricultural data plus few donor funded efforts and almost no recent academic research means that much has been assumed or aggregated. This limitation needs to be born in mind when applying the results of the analysis. Data was collected in Excel models and then transposed into the Agri-Food Value Chain Analysis (AFA) software.

Social analysis explores whether the beef value chain is socially sustainable. It investigates the existing social conditions and social relationships in the value chain, considering national policy and the institutional context in which the value chain functions as well as local level conditions including local norms and values and informal institutions. It contributes to discussion on whether potential economic growth in the value chain can be socially inclusive. It identifies the positive and negative social impacts, potential risks and benefits of the development of the value chain. The investigation followed the six domains 1) Working Conditions, 2) Land and Water Rights, 3) Gender and social inclusion, 4) Food and Nutrition and 5) Social capital and 6) Living conditions. The social analysis draws on multiple and diverse sources, including national statistic (ZimStat reports), data collected through baseline survey from different development projects (e.g. FAO-EU livestock project), and information collected during our fieldwork (through interviews and focus group discussions). A challenge facing the social analysis is that it deals with sensitive issues in the context of Zimbabwe such as workers' rights and land reform. We have been accompanied during part of our field work by an official of the central intelligence office. It was then not always possible to discuss freely these tough topics with our respondents.

Environmental analysis evaluates the environmental sustainability of the value chain. The scope of the analysis consists of three areas of protection: Human health, Ecosystem quality and Resources depletion, to which a set of environmental impact categories and corresponding indicators are associated. The analysis is conducted using Life Cycle Assessment (LCA) through the Simapro® software. The calculation of relevant environmental impacts in LCA is based on an exhaustive and quantitative inventory of all input and output fluxes over the entire life cycle of the studied system. Similarly, to economic analysis, environmental analysis faces to shortage of quantitative data on functioning of the different actors of the value chain (agricultural inputs, energy used, buildings and materials, etc.).

In support to the methods outlined above, the team undertook an extensive review of the available secondary and 'grey' literature, and conducted a broad set of interviews with a wide range of different stakeholders and actors. A full list can be found at Annex 1. Field visits were conducted to sites identified of a sample representing different actors and farming systems (Bulawayo and Chiredzi areas, see Figure 4).

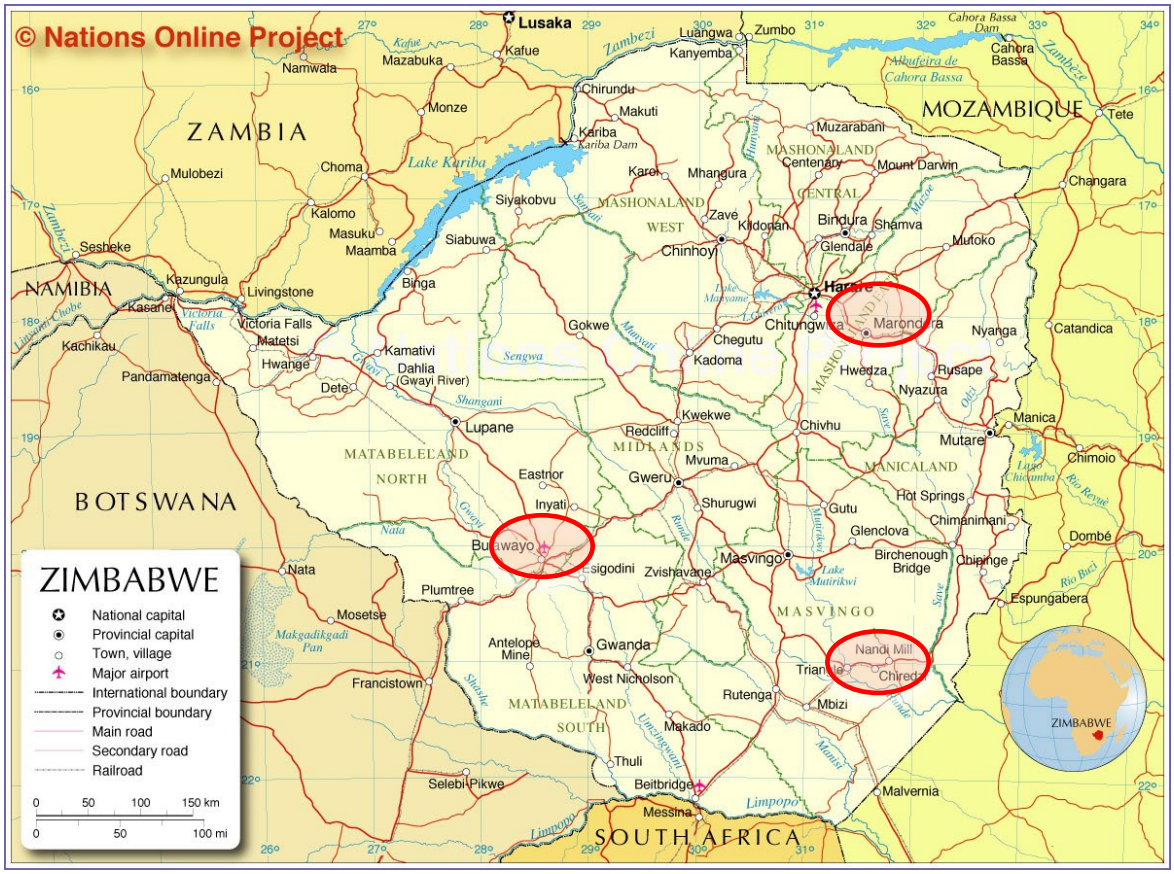


FIGURE 4: MAP OF FIELD RESEARCH LOCATIONS

For the economic analysis, in-depth individual guided interviews with in-chain actors were conducted. All efforts were made to ensure that these businesses/operations were typical or as representative as possible for that group of actors. Aggregate data was compiled from a mixture of sources including donor reports, government data where available and in some cases from trade organisations and farmers unions (see for example ZimStat 2013, 2015a, b, c, d; EU and FAO, 2014; World Bank 2013, 2017 a, b; and Annex 6).

For the social analysis, an extensive use of available (grey) literature has been done in order to draw a first picture of the social context and to spot the main issues and gaps of knowledge for the social analysis. Indepth individual guided interviews with in-chain actors and representative of different institutions (workers and farmers unions, central and local administrations…) were completed by focus groups discussions in order to address specific topics such as women inclusiveness (group of rural women), child labour and job attractiveness (group of pupils), and constrains to enter the value chain (group of young farmers).

For the environmental analysis, data from economic analysis have widely reused completed by available literature.

2. FUNCTIONAL ANALYSIS

2.1 Introduction and background

The functional analysis maps and described the main actors, activities, and operations in the chain and provides an overview of the main products, production systems and product flows. It also considers: the historical and current context, production structure, farming systems, governance structures and important constraints.

2.1.1 Historical background

To understand the current beef value chain in Zimbabwe it is important to set the existing system in its historical context. While Mavedzenge et al (2008) identifies four periods of different market configurations and political contexts we would propose five as follows:

Period 1: Pre-colonial – 1887. Farming systems consisting of extensive non-commercial cattle ranching on open grazing.

Period 2: Early colonial – 1888 to 1937. Emergence of a dualistic beef farming system based on large commercial farms owned by white settlers and continuance of the open grazing communal farming system based on reserves.

Period 3: Late colonial to early post independence – 1937 to 1999. On the one hand, traditional extensive beef production on communally owned land in 'reserved' areas using informal marketing channels. On the other hand, commercial, large scale beef production on ranched private land with a high degree of market regulation and government support dominated by state-led marketing tools such as the Cold Storage Commission (CSC). This phase was reinforced by the guaranteed export markets provided under the ACP-EU Partnership Agreement (known as the Cotonou Agreement) that provided an annual export quota for reduced tariff boneless beef to the high value EU market. This trade peaked at 14,503 tonnes in 1993. Zimbabwe gained independence from the United Kingdom in 1964. This made little difference in the beef sector. Limited land reform occurred from the Lancaster House agreement in 1979 based on a willing buyer-willing seller arrangement and a series of model plans including a village model ("A1") and small scale commercial ranching ("A2") (Scoones et al, 2010:22).

Period 4: Accelerated land reform – 1999 to 2007. Collapse of the managed land reform process and the start of land invasions ("Jambanja"). Transfer of large amounts of previously commercial beef farm land into various new types of ownership ranging from small scale communal use to large scale commercial cattle ranching under new ownership. This phase was characterized by extreme macro-economic conditions: super inflation, massive currency devaluation, disintegration of the formal economy and emergence of the informal economy. During this phase the role of managed beef marketing collapsed, the CSC no longer took a role and a break-down in movement control precipitated escalation in disease outbreaks, particularly foot and mouth (FMD) disease.

Period 5: Partial reinstatement of centralized control – 2007 to date. A series of attempts to reformulate the pre-1999 beef marketing model through state control measures including movement control, price control and closure and subsequent re-opening of private abattoirs. This phase, which continues to date, sees the sector dominated by the secondary and informal economy, absence of any export trade due to disease, and widespread re-emergence of beef among the majority of farmers as a risk management tool to mitigate against economic shocks.

2.1.2 Current context

Economic context

Zimbabwe has a relatively diverse economy that has seen some decline in recent years, noticeably in the manufacturing sectors. Agriculture is the mainstay of the Zimbabwean economy, followed by mining and services. WTO (2011: vii) notes that "state ownership and intervention in the economy remain significant, rendering the supply of key goods and services inefficient and costly". Gross Domestic Product (GDP) growth was in the range of 0.5% - 1.3% in the period 2015-17 reflecting a lack of economic activity brought about by rainfall variability, high cost of production and erosion in competitiveness (ADB, 2017). At the time of this research the economy was experiencing a shortage of foreign currency critical to fund inputs. In addition, balance of payments deficits, falling fiscal revenue, capital flight and deflationary pressure have limited development expenditure. Allied to this, cash shortages have driven a lot of the economy into the informal space, exacerbating other economic challenges. In the agricultural sector, the Government of Zimbabwe's response to these challenges has been the implementation of the "Command Agriculture" programme with subsidized inputs for maize in 2017 and guaranteed purchase at well above import parity prices (World Bank, 2017a:2). As this was implemented during a year of good rainfall, it has significantly boosted output. A "Command Livestock" programme along similar lines is now proposed.

In terms of the business climate, Zimbabwe ranks 159/190 in the World Bank 'Doing business' indices (World Bank, 2017b), and 154/176 in the Corruption Perceptions Index (Transparency, 2017), reflecting some of the difficulties that individuals and firms might have in conducting day-to-day business and trade.

Agriculture remains the mainstay of the Zimbabwe economy contributing about 18.5% of GDP and employing something like 66% of the national labour force (WTO, 2011:63). The country has 5 'Natural Regions' with varying rainfall (MOA, 2017). In all of these, livestock plays a central role.

Whilst per capita GDP has increased, per capita contribution to agricultural value added has been static (see Figure 5).

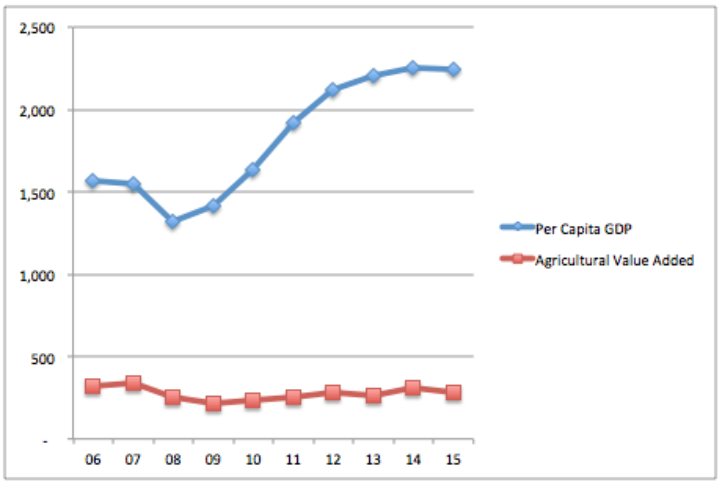


FIGURE 5: ECONOMIC TRENDS AND AGRICULTURE 2006 - 2015 (US$)
Source: UNDATA (Agricultural value added) and IMF (Per capita GDP)

In recent times, Zimbabwe has moved from an occasional food surplus country based on a small commercial agricultural sector, to a food deficit country based on small scale mixed grain and livestock production with elements of cash crops such as tobacco and cotton, largely on family farms of less than two hectares.

Zimbabwe has undergone a significant period of land reform. In 1980 6,000 farmers, mostly white, farmed 15.5 million hectares of land intensively and commercially. Several different land reform schemes have resulted in an abundance of new farmers. Figures are patchy, but 4,000 commercial farms would have been seized and 161,500 to 300,000 farm households have been resettled on about 4.9 million hectares (Scoones et al, 2010).

Rapid land reform and economic changes allied to poor data makes defining land use types in Zimbabwe a challenge. Here we have elected to define production actors into three economic and social categories that reflect farming system, land holding size and land reform status (see T 3)[2].
Note that we have chosen to leave out of this calculation the estimated 1.6 million hectares of land that fall into the category of 'trusts, parastatals, conservancies and unallocated land' as those interviewed suggested that little economic activity was occurring in these areas at the time that the research was conducted.

[2] Many information that could enable to describe precisely the functioning of the seven different types (official typology) and the different interactions between them and other actors of the VC was lacking. This would need deeper investigations (more surveys, more field missions, more areas, etc.) and would result in a more complex functional analysis. The figures we obtained in this study (farming system models) is a good trade-off between the need to draw a good picture of a so large VC in a short time (simplification) and need to produce relevant results enabling to drive research actions and policies.

Farm categories	Farmer types	Farms/households		Area held (a)		(b)		Average farm size
		No. (000s)	%	Ha (millions)	%	Ha (millions)	%	(ha)
Fully communal	Communal	527,104	76.0	16.4	54.6	16.4	50.8	31
Sub total		527,104	76.0	16.4	54.6	16.4	50.8	31
Partially communal	Old resettlement	65,330	9.4	3.7	12.3	3.5	10.8	57
	A1	78,427	11.3	4.2	14.1	4.1	12.7	54
	Small A2	5,349	0.8	1.0	3.3	1.8	5.4	187
Sub total		149,106	21.5	8.9	29.8	9.4	28.9	60
Fully commercial	Old small scale commercial	11,692	1.7	1.4	4.7	1.4	4.3	120
	Large A2	5,349	0.8	0.9	3.0	1.8	5.4	168
	Commercial	659	0.1	0.9	3.0	3.4	10.5	1,366
Sub total		17,700	2.6	4.7	15.6	6.6	20.3	266
Total		693,909	100.0	30.0	100.0	32	100.0	43

TABLE 3: LAND REFORM CATEGORIES, AREAS AND FARM SIZE FOR BEEF CATTLE FARMERS[3]
Source: Scoones et al (2010) and Institute De L'Elevage (2013)

As we shall see below, adopting these three categories of land use type for livestock production greatly facilitates simplification of the overall value chain analysis and provides a strong foundation for the later economic analysis using the AFA model.

Social context

Zimbabwe population was estimated to be 13.94 million people in 2015 (the last census in 2012 recorded 13.06 million people). The population is young (42% under 15), mainly rural (68.3%) with more women than men (52.4% of women, men being more likely to migrate for economic reasons, largely to neighboring countries).

The socio-economic situation of the population has been impacted by the different phases of economic and political instability described above. There are signs of a limited recovery since 2007 (although accurate data are missing) but the situation remains difficult for the majority of the population. After a drop from 1995 to 2005, the Zimbabwean Human Development Index (HDI) is slowly increasing, but is still low: its value for 2015 is 0.516—which put the country in the low human development category—positioning it at 154 out of 188 countries (UNDP, 2016). Main problems are related to poverty, food insecurity, unemployment, poor access to basic infrastructure and health services.

According to the last national socio-economic survey available, the PICES "Poverty, Income, Consumption and Expenditure Survey" conducted in 2011 (ZimStat, 2013), 72.3% of the population is poor, 16.2% is extremely poor, the province of Matabeleland North being the poorest. Malnutrition among young children is high, affecting 33.8% of children between 6-59 months of age, according to the national nutrition survey conducted in 2010 (Food and Nutrition Council, 2010). HIV continues to be a serious problem, although the estimated adult prevalence has dropped from 20% in 2005 to 15% in 2010 (ZimStat, 2015). Despite the redistributive land reform, rural areas are more deprived than urban ones as shown by different indicators of equity (Unicef, 2016). Such disparities drive rural-urban migration, and migration to neighbouring countries. Many indicators show that

[3] The total land areas of Zimbabwe is 38,685Km2. The distribution of the pasture and use for cattle among different categories of farmers and cattle owners is not particularly clear since there is no up to date land survey. In this table we see two calculations, adapted from (a) Scoones (2010) and (b) Institute de L'Elevage (2013) to illustrate the challenge. We adopt the Scoones figures.

the situation is particularly tough in rural areas: for example, 76% of households are poor in rural area (38.2% in urban one) and 30.4% are extremely poor (5.6% in urban areas).

Rural families' livelihoods are also highly vulnerable to droughts and flooding that affect incomes generated by agriculture. In this context livestock is a main coping strategy. It supports the livelihood of 70% of the population according to the National Livestock Development Policy. In small scale farms, cattle holding and maize output and yield are highly correlated (Scoones 2018). Farms with no livestock are then probably the more vulnerable also.

Environmental context

Zimbabwe is a semi-arid country in which more than 85% of the area receives less than 800 mm of rain per year. The country has abundant natural resources including for instance land, biodiversity, or minerals. However, as shown by Akesson et al. (2016), sustainability of these resources in Zimbabwe are largely challenged, especially by mining and agriculture, the most significant economic sectors.

Land degradation, including soil erosion and land pollution, is a serious problem in Zimbabwe with significant consequences for agricultural productivity, particularly for people living in poverty. It is caused by a number of factors such as deforestation, uncontrolled veld fires, sand extraction, artisanal mining, and poor land management in general (e.g. improper wetland utilisation, overgrazing, agriculture expansion, and human-wildlife conflict).

The deforestation rate in Zimbabwe is very high, currently hovering around 1.9% (World Bank, 2015). The main causes of the deforestation are poverty related and include fuelwood collection and timber extraction, land clearing for cultivation, and energy for tobacco curing. Low household incomes and high costs for other types of energy are driving forces.

Zimbabwe is a semi-arid country and water, which is a key resource, is unevenly distributed in time and space leading to recurring water scarcity (Davis and Hirji, 2014). Although it shares one of the world's greatest water bodies, the Zambezi River, it does not currently supply water to the rest of the country. Thus, groundwater constitutes an important source of water for both rural and urban areas. Reduced water availability is caused by over-extraction due to population growth, urbanisation and industrialisation, resulting in increased competition between water using sectors.

Water and Air Pollutions are also concerns. They could be caused by inadequate or non-existent treatment of municipal and industrial wastewater, especially due to population growth, intensive urbanisation, increased industrial activities (especially mining) and high exploitation of cultivable land (HRW, 2013). Traffic and industries or the extensive use of fuel wood for tobacco curing is a major cause to indoor air pollution. Sources of water pollution by heavy metals and chemicals through mining activities, industrial and manufacturing works can also be observed.

In addition to water pollution (Mhlanga and Madziva, 1990) use of there is also use of pesticides in some agriculture sectors, as for instance cotton production (Maume and Swinton, 2003).

Despite long history of biodiversity preservation (plants, mammals, reptiles, and birds), providing important ecosystem services, livelihood opportunities and income from tourism, Zimbabwe is now facing Biodiversity loss (WWF, 2016). This is caused by: habitat destruction from expansion of agricultural lands, timber logging, fuelwood collection, poaching, and invasion of alien species, droughts, fires, and high elephant densities. The distribution of people and productive agricultural resources is uneven, leading to problems of land degradation, where large numbers of people and livestock are concentrated on marginal lands.

Finally, Climate Change results on one hand in hotter days and, on the other hand, fewer cold days than before. According to the Zimbabwe Meteorological Service, daily minimum temperatures have risen by approximately 2.6°C over the last century while daily maximum temperatures have risen by 2°C during the same period (Brown et al., 2012). In another hand, Climate Variability results in uncertain timing and amount of rainfall. While increasing temperatures of around 2.5°C by 2050 have been projected, rainfall is predicted to decrease in all seasons (SARUA, 2014). As shown below Zimbabwean rain fed crop production systems could be among the most impacted in Africa by future Climate Change, considering the worst GHG emissions scenarios.

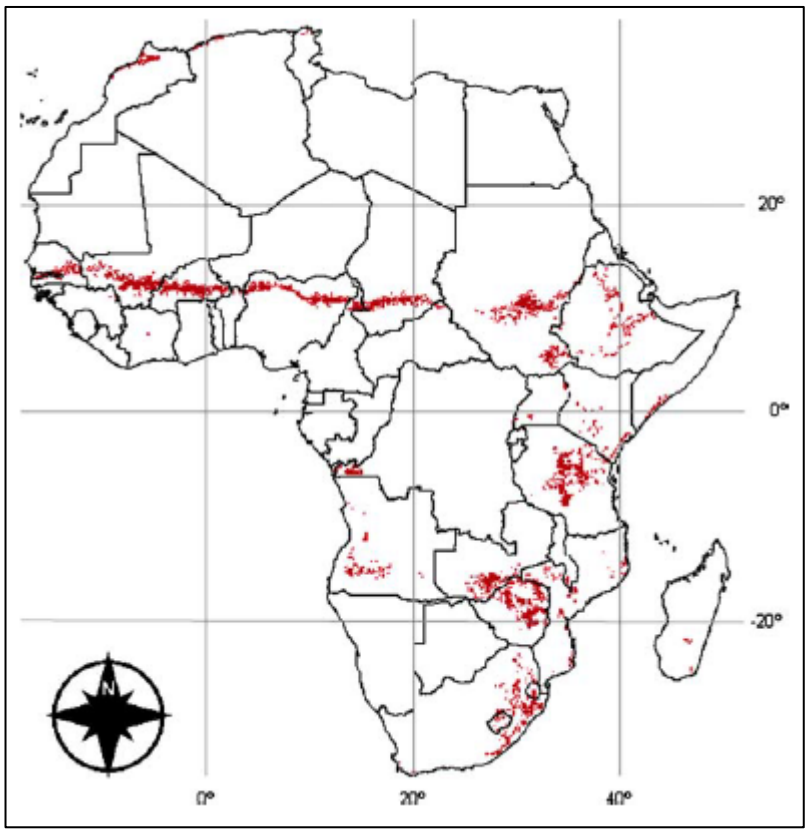


FIGURE 6: TRANSITION ZONES (IN RED) IN WHICH RELIABLE GROWING SEASONS FOR RAIN FED CROP PRODUCTION SYSTEMS COULD FALL BELOW 90 DAYS BETWEEN 2000 AND 2050
Source: Jones and Thornton, (2009)

Many of the environmental challenges are interdependent and mutually reinforcing. For instance, land degradation is partly caused by deforestation, which also affects biodiversity, ecosystem services including water regulation and purification, resulting in reduced capacity to buffer against drought or floods, and so on. Moreover, climate change is expected to enhance the environmental

stresses already experienced. In this sense, Zimbabwean government is more and more aware about needs for specific environmental policies. Implementation of National Adaptation Plan (NAP) to climate change is an example of such awareness. NAP is a flexible process that builds on the country's existing adaptation activities and helps integrate climate change into national decision-making.

2.2 General description of the beef value chain in Zimbabwe

2.2.1 Beef and the Zimbabwean economy

Production and consumption

The population of beef cattle[4] in Zimbabwe has been varied substantially in the past two decades (see Figure 7). Whilst figures are not easy to verify, MAMID estimates the national beef cattle herd to be around 5.5 million head.

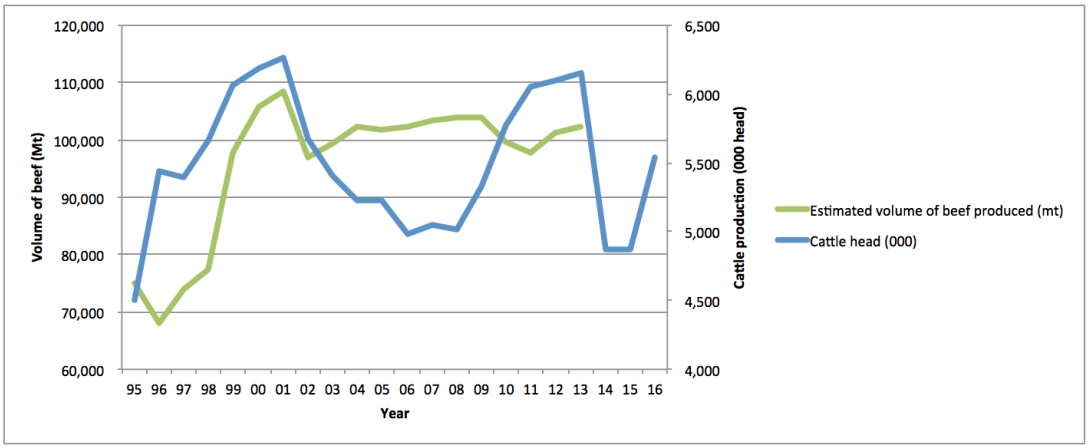


FIGURE 7: BEEF CATTLE POPULATION AND BEEF PRODUCTION: 1995 – 2016
Source: Department for Livestock and Veterinary Services, MAMID and FAOSTAT

Cattle production and beef off-take grew substantially up to 2001 reflecting growth in the commercial sector driven by strong exports. The impact on cattle production can be seen between 2001-2008 as commercial farms were de-stocked and this de-stocking is reflected in a steady flow of animals into the market. Re-stocking occurred between 2008 and 2013, followed by a severe drought.

We have estimated the beef cattle population by the three major categories of production actors suggested in T3 using the Zimstat surveys of 2014 (Zimstat 2015 b-g)[5]. The results are presented in Table 4.

[4] We exclude cattle kept and reported solely for beef production. However, there is some overlap between dairy and beef sectors. In the beef sector animals are predominantly multi-purpose, including for milk production for domestic use and sale.
[5] We also observe that this three scale cluster framework has been adopted more recently by the Institut de L'Elevage (2013:28).

Farm categories	Farmer types		Zimstat			
VCD4A 2018	Scoones (2010)	MOA Ag Policy 2012	2014			Average animals per household
Reference	(a)	(b)	(c)			
			No. of farms/house holds with cattle	No. of animals	%	Head
			No.	Head		
Fully communal	Communal	Communal	527,104	3,037,750	62	5.8
Sub total			527,104	3,037,750	62	5.8
Partially communal	Old resettlement		65,330	487,903	10	7.5
	A1	A1	78,427	748,909	15	9.5
	Small A2	A2 (50%)	5,349	182,083	4	34
Sub total			149,106	1,418,895	29	9.5
Fully commercial	Old small scale commercial	Small scale	11,692	136,703	3	11.7
	Large A2	A2 (50%)	5,349	182,083	4	34
	Commercial	Commercial	659	92,926	2	141
Sub total			17,700	411,712	8	23.3
Total			693,909	4,868,357	100	7

TABLE 4: BEEF CATTLE POPULATION BY FARM CATEGORY

Sources:

(a) Scoones et al (2010)
(b) Government of Zimbabwe (2012)
(c) Zimstat (2015b-g)

What Table 1 and Table 2 illustrate is that the largest proportion of the national beef cattle herd is farmed on a relatively small scale and on a communal farming system. Different categories of partially commercial farmers represent around 29% of the total cattle population whilst various types of commercial beef production account for only 8% of current production. The different scales of production are illustrated by the average number of animals per household, which is around 5-6 for communal, 9-10 for partially communal and 23.3 for fully commercial farms.

The analysis of land reform, farm production type and beef cattle population above reflects the key strategic changes that have occurred in the Zimbabwean rural economy since 1999. These changes to farm ownership, occupation and use[6], far from leading to a decline in the total number of beef cattle in the country, have actually seen a substantial increase in stock (8.5% in the period 2008 to 2015). Important changes to the macro economy during this period outlined above have resulted in some adjustments in the national beef cattle herd.

The areas that can be broadly described as communal or lying with the range of communal and partially communal have increased for a number of reasons including: changes of animal type on new and resettled land from large frame high yielding to small frame traditional species; and, declining off-take rates (said to be 6% against a recommended 20% to meet domestic demand). This has led to widespread overstocking on open-access land. The transition of this larger numbers of farmers to a communal or partially communal farming system on resettled land has seen a decline in calving rates on the converted land to the average on communal land of 45% (against a possible

[6] NB: there has not been a comprehensive land audit since this process started, so exact figures on who farms what and where are very patchy and to some extent misleading since much attention has been placed on resettlement land when in fact the majority of farmers remain on communal land and still practice the same cattle keeping that they always have, except that the economy has weakened in the background

calving rate of around 60%). Thus whilst the total number of farmers with cattle has increased, productivity per capita has declined.

Using this analysis we summarise the different types of farming systems and farm models in Table 5 below.

Parameter	Farm category		
	Fully communal	Communal/Commercial	Fully commercial
Number of farms	527,104	149,106	17,700
% of farms	76	21.5	2.6
% of area	54.6	29.8	15.6
% herd	62	29	8
Average area (ha/farm)	31	60	266
Average herd size (heads of cattle/farm)	5-6	9-10	23.3
Characteristics of the production system	Mixed farming system: livestock/ staple food	Mixed farming system including cash crop (sugar, cotton, tobacco, etc)	Specialization: breeding, fattening
Main functions of cattle	Productive assets, (draft power, manure.), saving, social value	Mixed (assets and income source)	Income source
Breed	Indigenous breed: Mashona, Tuli, Nguni, and various cross-breeds.	Variable	Mixed breed. e.g. Tuli, Limousine, Brahman, Angus
Feeding system	Grazing (communal area) and limited crop residues	Grazing and occasionally stock feeding	Grazing and regular stock feeding
Main constraints	High rate of heads of cattle/ ha	Lack of support (technical, credit…).	Uncertainty (e.g. in land access) makes investment hazardous. Lack of fences.
Main strengths	Low production cost	Low ratio of animals to production area	High productivity/ animal production concentration

TABLE 5: SUMMARY OF DIFFERENT TYPES OF CATTLE FARMS AND FARMING SYSTEMS IN ZIMBABWE
Source: Tables 3 and 4 plus interviews

Several other factors are at play in the structural change that has occurred in the beef sector and we review these factors here.

Collapse of exports largely as a result of declining disease control systems (see Figure 8). In the 1990's Zimbabwe had a successful and lucrative beef export industry built largely upon preferential market access to the European Union and the Lome Agreement. This access still exists, but is dependent upon maintenance of the national bio-security system. Despite efforts to control animal movement, Food and Mouth Disease (FMD) is now endemic in Zimbabwe and having regional

implications[7]. FMD spreads from buffalo populations in Zimbabwe because: (a) buffalo and cattle are not separated adequately; and, (b) cattle is moved from high-risk areas, such as the low-veld, to high value areas, such as Harare despite strict controls. FAO (2016:iii) note that: "there is considerable anecdotal evidence for irregular and/or illegal movement of livestock in Zimbabwe despite the existence of an elaborate permit system involving the police and DVS". This view is strongly supported by interviews of farmers, veterinarians and traders conducted for this research.

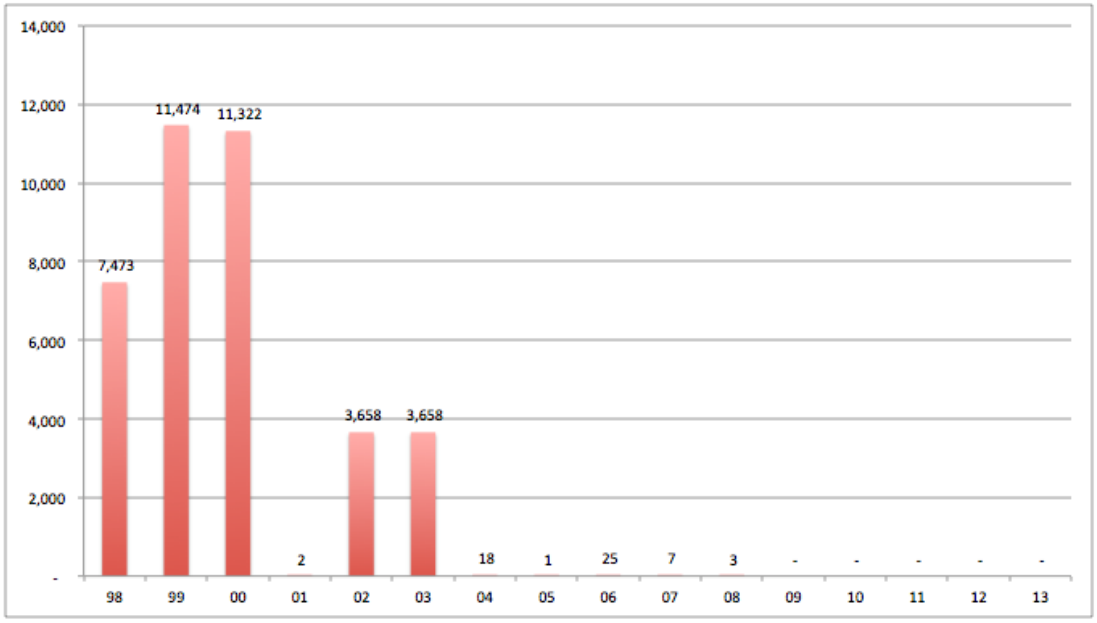


FIGURE 8: EXPORTS OF CATTLE MEAT, 1998 - 2013
Source: FAOSTAT

There is an unmeasured illegal export trade in meat carcasses and cuts from Zimbabwe to neighboring countries. This may be on a considerable scale (see Figure 9). The trade probably promotes stock-theft and certainly threatens biosecurity in the region. There would be also illegal import trade of offal from neighbouring countries to support national demand for low price meat.

[7] For example, the Government of Botswana donated 0.5 million doses of FMD vaccine to Zimbabwe in September 2017 in part of measures to protect its own border regions (New Zimbabwe, 2017)

FIGURE 9: EXAMPLE OF INFORMAL MEAT PROCESSING AND EXPORT TO MOZAMBIQUE
Source: Photo credit Charles Chakoma, 2016

The area of Chiredzi is an endemic FMD zone (and is what is known as the "red zone"), the control of cattle movement is still running (even if it is not enough to avoid illegal movement) since it brings important financial resources for the veterinary services and others local administrations. Live animals are not supposed to move from the area; only meat can be sent to the consumption zones. Large-scale abattoirs (1000-1500 heads/month) send beef carcasses to the major cities (Harare, Mutare, Kwekwe…) but a share of the offal (up to 60%) stays for the local rural market.

With the end of the strict control of FMD, local farmers do not suffer any more animal culling in case of FMD outbreaks (but they are still submitted to a quarantine of a month after the last case, within a 20 km radius around the place of the outbreak); and abattoirs can keep sending meat to consumption areas if it comes from their own livestock. This, combined with the difficulty of supply, encourages the integration of the production stage by the slaughterhouses (source: our interview). Abattoirs invest in beef production based on their own feedlots and in out-grower schemes to secure their supply (in quantity and quality).

The costs of redressing the current disease status in Zimbabwe to allow international trade to resume are uncertain, but likely to be substantial and require a long-term investment in infrastructure. The starting point is an effective traceability system followed by development of exports using a Commodity Based Trade (CBT) approach. CBT recognizes that some foods can be safely traded if the risks of harm are managed along the value chain. The approach has been accepted by the World Organisation for Animal Health (OIE)[8], but has, so far, not been widely applied. Issues constraining its use include uncertainty about how CBT can be applied and regulated, and, crucially, lack of enthusiasm from key markets and end users of CBT regulated products[9] (Queenan et al., 2017).

[8] see OIE, (2015), Article 8.8.22
[9] There is a lively debate in the literature on this subject. See for example Naziri et al (2015) and Thomson et al (2013) for a range of views.

Declining demand for beef in cities, towns and for institutional buyers such as for farm workers and mines. Whilst it is estimated that 237,858 households received access to land during the reform process (GoZ/UN, 2010)[10], widespread economic disruption, low productivity, unemployment (not least of >200,000 former farm workers on commercial land) the declining domestic economy and terms of trade have reduced per capita income and impacted on demand for beef and beef products (see above). Institut de L'Elevage (2013:76) reports that beef consumption in Zimbabwe, once the highest per capita in the region at 13kg has now fallen to 3.8 kg[11]. Nevertheless, this consumption is underestimated by the different sources, since it is based on the production of carcasses and does not take into account the share of offal (there is approximately 18 kg of offal per carcass). Offal are important for the low-income consumers, since there are much more affordable (see below the consumption section).

Increased availability of alternative cheap and convenient meat is becoming important in Zimbabwe with the import of chicken meat in various forms. Figure 8 shows that domestic poultry production has remained fairly static in Zimbabwe, but imports have nearly double supply. Chicken is a cheap and convenient source of meat, particularly for urban dwellers. Local consumers are simply following an international trend. In the same period, formal beef production in Zimbabwe has remained largely static at somewhere in the region of 124,000 tonnes per annum[12].

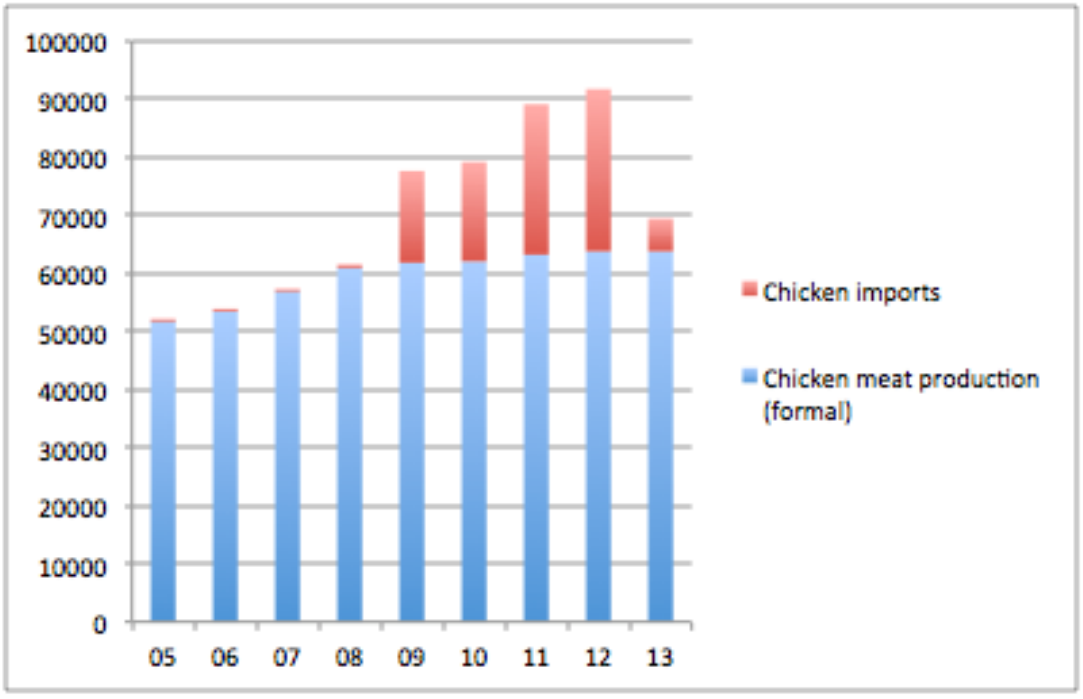


FIGURE 10: FORMAL PRODUCTION OF CHICKEN MEAT AND IMPORTS (TONNES)
Source: FAOSTAT

Economic uncertainty and the absence of financial services seems to be driving beef as a source of savings. The likelihood of the return of inflation, the fear of currency devaluation and the absence

[10] As we have mentioned, figures for resettled farms, farmers and households are somewhat patchy. A figure of 161,500 households is more consistent with the estimate of A1 and A2 farmers (see Table 2)
[11] Inconsistencies in these beef consumption figures are noted. The trend, however, is consistently downward.
[12] We treat some of this data with skepticism: the FAO statistics are largely estimates or projections.

of suitable savings mechanisms in rural areas means that farmers have become used to using herd grow as a risk aversion strategy. When this is combined with other reasons for owning cattle, such as draught power for planting (particularly important in recent years with the implementation of the Command Agriculture programme), retention of animals for cultural purposes (i.e., gifting and status), domestic milk production and as a source of organic fertilizer when other fertilizer is not available, it can explain the consistently low off-take rates that are prevalent in communal and partially communal production systems.

The changing structure of land holding and cattle ownership has also led to important changes in the ratio of 'improved' to 'traditional/indigenous' animals and in the animal management strategies that farmers apply as an increasing proportion of the national beef herd is farmed communally or semi-intensively. Indigenous breeds are considered hardier than improved breeds in communal/extensive farming systems. Breeding in Zimbabwe has in the past focused on commercial breeds for the high-quality export market. With the change in cattle holding, ownership objectives have also changed. Cattle are kept longer before slaughter, so the amount and quality of usable meat per animal has declined (see above, average carcass weight of animals slaughtered has declined from 200kg/animal to 167kg/animal in relation with the return to more traditional breeds due to changing ratios of usable meat to animal frame). Weaning percentages in the expanded communal and partially communal production systems are well below commercial rates (e.g., 65%). Absence of improved breeding stock combined with increase communal grazing has reduced the size and quality of animals over time. These new or expanded production norms can be efficient (Tavirimirwa et al., 2013) but farmer training and support mechanisms have not kept pace with demand.

Feed and feeding issues

Recent high domestic maize prices combined with shortages of cash in the economy has squeezed the animal feed industry. Some ingredients have become hard to find, such as molasses. Most feed companies in Zimbabwe have focused their efforts on the poultry and dairy sectors as demand in the beef sector has fallen away. Traditional communal grazing production systems have come under stocking pressure from increased animal populations. New 'communal' grazing is being practiced in unfenced resettlement areas by A1 and A2 farmers. This method involves feeding at night and releasing animals to roam during the day. This has severe implications for productivity. This has also implications for the development of "poach grazing" and conflicts with communal farms (see the social analysis).

Formal and informal levies, duties and rents.

The domestic economic challenges that Zimbabwe has faced in recent years has meant that both formal and informal actors have had to look to sectors of the economy where value is present to support budgets and income (Chamboko and Erasmus, 2014). For example, the budget received by the district vet services from the central government only covers the salaries. As a consequence, services brought to farmers have to be funded by the collected levies, duties and rents. To escape to these heavy levies, slaughterhouses have partly shifted their source of supply from public auction (submitted to levies, at the charge of the buyers, of 10.5% of the value of the animal: 6% for the RDC, 1.5% for vet inspection, 2% for the grading of the carcass, and the rest of auctioneer and others) to

direct purchase from farmers (through the intermediary of an agent/middleman). At the moment, livestock trade contributes only to 2% of the budget of a rural district council (RDC) like Chiredzi. This is one of the reasons why RDCs are promoting more of the public auctions in order to increase their source of income although it is also argued that public auctions give higher prices for farmers, although we have not seen evidence that supports this supposition.

Stock theft seems to be endemic in Zimbabwe, especially in communal and partially communal areas where animals are open grazed and branding is not common practice. Despite the threat of life in prison for those caught, 2017 saw the highest level of reported stock theft yet (NewsDay, 2017).

Cattle slaughtering practices.

Off-take rates are disputed in Zimbabwe, but common figures are 11% for Commercial and Partially Commercial/Communal and 5% for Communal production systems. Figure 9 shows slaughter estimated in 62 medium to large abattoirs and is estimated to be about 70-75% of national slaughter with the remaining slaughter occurring either in very small urban abattoirs, at rural butchers or on farm.

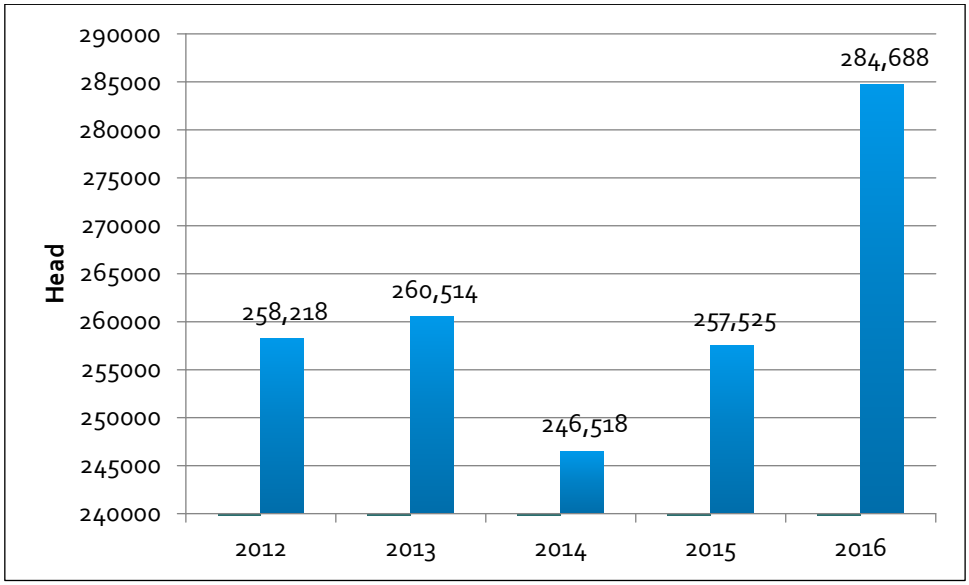


FIGURE 11: CATTLE SLAUGHTER (FORMAL) 2012 - 16
Source: Data from LMAC

The Zimbabwe Abattoir Association estimate that 96% of all purchases are from 'smallholders' and that the share of this function is 42% village based buyers (middlemen), 51% direct sale from farmers to abattoirs and only 7% sale through auctions (ZAA, 2017).

Animal disease challenges

Historically, the management of animal health has always been a major priority of the authorities (compared to other issues related to livestock farming) with a focus on the control of FMD (though zoning) and tick-borne diseases (through the dip tanks).

FMD affects cattle productivity and its control is a major challenge if the objective is to export to FMD free countries, e.g. EU. Zimbabwe is divided into three zones for FMD control: infected, high surveillance and FMD free. Despite effort to limit animal movement, outbreaks and secondary outbreaks still occur, particularly near to areas with buffalo and along value chains (46 outbreaks were reported in 2017, according to the OIE country report). DVS (2017) report delays in farmers reporting outbreaks, inadequate vaccination (currently $2 a dose but there is not enough available doses) and illegal animal movement as the main causes.

Tick-borne diseases are a major challenge since they can cause cattle mortality and can be controlled by dipping animals with acaricide. Traditional community dip tanks are in poor condition. Dipping rates are below those necessary to contain disease. No government subsidy is available for dipping so farmers must pay (Z$2 per animal per year, 5% of it is retained by the dip tank committee for the maintenance of the dip tank). DVS report that Babesiosis, Anaplasmosis, Heartwater and Theileriosis are responsible for 55-65% of cattle mortalities (in January-February 2018, a Theileriosis outbreak killed at least 2,000 cattle heads. The outbreak of this tick-born disease is attributed to insufficient dipping).

There are other animal health issues such as anthrax, bovine tuberculosis (two zoonotic diseases) and lumpy skin disease.

Anthrax is endemic in Zimbabwe, but in recent years seems to be largely under control. Government stocks of TBD vaccines for sale have largely run out.

Lumpy skin disease has become common in many communal and partially communal areas causing up to 10% of mortalities in some areas. Again, lack of funds for vaccines is the problem.

At the moment, restoring the functioning of the dip tanks is probably a priority (compared to FMD control).

We conclude that the Zimbabwe beef sector faces a plethora of challenges, some structural (e.g., demographic movements, climate change), others the result of economic decline and a range of government policies (e.g., disease prevalence, loss of markets). Market organization is one of the major challenges.

Main and end products

The main end products of the Zimbabwe beef value chain are shown in Table 6. The livestock value chain is complex because products are diverse at different stages of the value chain and numerous choices can be made.

Product	Status	Sub-product	Tertiary product	By-product	Notes on the current status in Zimbabwe
Veterinary drugs	Formal/ Regulated	None	None	None	Mostly imported. Some value added by repackaging/branding
Animal feed	Formal/ Regulated	Bulk feed – stover etc	None	None	Only for elements of the commercial sector
		Various mixed rations	None	None	Only for elements of the commercial sector
	Informal/ Unregulated	Bulk feed – stover etc	None	None	No information on informal animal feed trade
Breeding stock	Formal	Bulls, heifers, calves, cows	None	None	Some limited breeding remains. Sales largely to commercial farms
	Informal	Bulls, heifers, calves, cows	None	None	Sales between farmers plus gifting and other traditional practices
Meat and meat products	Formal/ regulated	Meat cuts of different quality for various markets	Processed meat products, sausage, pies etc	None	Passes through a range of actors regulated by local government
		Offal etc (5th quarter)		Fertilizer	Passes through a range of actors regulated by local government
		Blood and bone		Fertilizer	Not currently used
		Hides	None	None	Currently not functioning
	Informal/ unregulated	Meat cuts of different quality for various markets	None	None	Meat and offal sold/used undifferentiated in the informal sector
		Offal etc (5th quarter)			
		Blood and bone			Unused in the informal sector
		Hides			Hides unused in the informal sector
Draught power services	Informal/ unregulated	Ploughing, weeding etc	None	None	Unmeasured, but important in communal and partially communal systems
		Transport			

Product	Status	Sub-product	Tertiary product	By-product	Notes on the current status in Zimbabwe
Milk	Informal/ unregulated	Raw milk	Traditional yoghurt, cheese etc.	None	Informal sales and gifting in communal and partially communal systems
Manure	Informal/ unregulated	Organic fertilizer	None	None	Unmeasured, but important in communal and partially communal systems

TABLE 6: LIVESTOCK PRODUCTS
Source: Interviews

Analysis of the main and end products shows that, for commercial beef production, these are fairly easy to define and measure as farmers have clear objectives and value streams that they target. In the communal and partially communal categories of producers, products and services derived from animal ownership are harder to define and measure.

Functions

Seven functions were identified in the beef value chain and these are elaborated in Table 7 below.

Function	Category	Nature	Quality	Place of delivery
Inputs	Animal Health Workers	Veterinary and animal health services. Provide technical advice.	Qualified vet's	Private veterinary health centres, friend and neighbours
			Government animal health workers	Government supported animal health centres and extension workers
			Unqualified/ unofficial community 'advisors'	Friend and neighbours, traditional healers
	Breeders	Sale of improved genetic material	Specialised breeders for commercial sector only	NGO's and commercial breeders on commercial farms
	Agrodealers	Import and sale of various different agricultural chemicals and feeds/feed supplements	Wholesalers, distributors and retailers	City outlets and through dealers and retailers
	Feed manufacturers		Registered producers of animal feed	Direct sales to commercial farmers

Function	Category	Nature	Quality	Place of delivery
		Production and sale of mixed animal feed		Sales through Agrodealers
Production	Fully communal farmers	Extensive mixed cattle farming on shared land using traditional methods	Farming objective = self-sufficiency, so small animals, low productivity, emphasis on alternative values such as draught power, milk, manure, status and gifting	Animals retained/consumed on farm or within near community unless cash required, then sale to other farmers, nearest abattoir, Traders/ middlemen, auctions or rural butchers.
	Partially communal/commercial farmers	As 'Fully communal' but including some fencing, a limited amount of supplementary feeding and some stock improvement.	As 'Fully communal' but including an element of off-sales and sometimes fattening.	As 'Fully communal'.
	Fully commercial farmers	Intensive beef cattle production using improved stock in both open and closed farming systems	All stock either sold or retained for herd improvement	Sales to auctions, abattoirs.
Transporters – live animals	More than 10 head	Transport owners of large (often specifically for animal) vehicles	Formal companies and specialist animal transporters	Mostly operating in the commercial or partially communal chain
	Less than 10 head	Transport owners of small (often multi-purpose) vehicles	Informal transport owners	Mostly operating in the communal chain
Intermediaries	Traders/middlemen	Buyers of animals directly from communal and	Mostly informal, but sometimes acting on behalf of abattoirs	Travel to farmers to source animals. Either sell at

Function	Category	Nature	Quality	Place of delivery
		partially communal farmers and sell at auction or to abattoirs. Also buy at auction.	under commission (agents).	auction or direct to abattoirs.
	Auctions	Organisers of animal sales at fixed locations and times for a commission	Some with fixed locations and other peripatetic.	Majority of animals at auction go to abattoirs. Some are returned to farmers for stock improvement or feed-lotting either directly or through traders/middlemen (speculators).
Processing	Abattoirs	Convert live animals into different elements for sale or further processing	Private. Several different models including 'service slaughter' and meat sellers	Sale to meat processors, meat wholesalers, and a range of retail actors.
			Public. Government parastatals doing both service slaughter and further processing	Sale to meat processors, meat wholesalers, and a range of retail/institutional outlets
	Meat processors	Makers of pies, sausages and salamis	Private companies of various kinds of horizontal and vertical integration and scale.	Buy carcasses from abattoirs and make processed meat products. Sell to retailers.
	Hide manufacturers	Buy hides and process	Wet blue for export	Export. Very limited domestic processing at time of study.
Retail	Supermarket, shops and butchers	Mixed food outlets of various sizes with a license to sell meat and meat products.	Private companies	Buy carcasses and meat cuts / offal from abattoirs and wholesalers. Sometimes repackage. Sell to consumers and informal retailers
	Catering, restaurants and institutions	Restaurants, and other formal and	Private companies or informal businesses	Buy carcasses and meat cuts / offal from abattoirs and

Function	Category	Nature	Quality	Place of delivery
		informal food outlets		wholesalers. Sell to consumers as cooked meals.
	Rural butchers	Un-registered rural meat processors and retailers	Buy individual animals from communal farmers and partially communal/commercial farmers. Have very limited infrastructure (knives and a tree – often no refrigeration)	Buy live animals and sell to consumers as 'piles' or cuts
Consumption	Meat consumers	Farmers	Whole own slaughtered animal (only on special occasions)	Household
		Non-farmers	Low income consumers mainly consume offal (3$/kg)	Household
			Middle income consumers mainly consume a mix of beef meat (4.5$/ kg) and offal. These consumers value fatty meat	
			High income consumers ("the ones of Borrowdale") consume lean meat (up to 8$/kg)	

TABLE 7: FUNCTIONAL ANALYSIS
Source: Interviews

Actors in the beef value chain

Figure 3 maps the value chain for the Zimbabwe beef value chain. In this section we discuss the definitions of actors identified by the research. This is done in the order of flow used in the functional analysis Table 7 above. In this section we attempt to categorise and enumerate each actor type. We also propose normative actor descriptions for use in the economic and environmental analyses in later chapters.

Input suppliers

For the Zimbabwe livestock sector there are four main suppliers of intermediary goods and services: technical advisors, breeders, agrodealers and feed manufacturers.

Table 8 shows the number of communal farmers found to be using different inputs for beef production and the value of those inputs. A proportion of communal farmers (roughly between 14% and 30%) are using veterinary services, dipping and vaccines, although this proportion is probably well below government aims. Very few communal farmers are purchasing feedstock but value relative to other inputs seems high. This stock feed figure may also be distorted by drought.

Item	Household	Quantity (Mt)	Value (US$)	Value/household (US$)
Purchased stock feed	43,474	6,861	2,929,655	67.39
Homemade feed	693	-	22,663	32.70
Home grown fodder	686	-	16,974	24.74
Veterinary services	151,091		1,585,399	10.49
Dipping levy	360,468		3,798,743	10.54
Vaccines	222,361		3,834,635	17.25
Detergents and disinfectants	65,969		922,756	13.99
Other	10,982		229,939	20.94
Total			13,340,764	198

TABLE 8: INPUT PURCHASE BY COMMUNAL FARMERS 2014
Source: Zimstat (2015b:59)

In Table 9 and Table 10 we can see that partially communal/commercial farmers use more inputs than communal farmers. The A2 category spends more on inputs, particularly purchased feed, but is a much smaller number of farmers. We conclude that the average purchased input value for this category of farmers is nearer to $300 per household than $1,100.

Item	Household	Quantity (Mt)	Value (US$)	Value/household (US$)
Purchased stock feed	12,554	4,079	1,024,349	81.60
Homemade feed	10,988		662,916	60.33
Home grown fodder	30,590		2,047,943	66.95
Veterinary services	23,839		419,516	17.60
Dipping levy	55,562		938,403	16.89
Vaccines	53,905		1,578,313	29.28
Detergents and disinfectants	18,678		421,238	22.55
Other	1,038		18,084	17.42
Total			7,110,762	312.62

Table 9: Inputs purchased by A1 farmers 2014
SOURCE: ZIMSTAT (2015C:47)

Item	Household	Quantity (Mt)	Value (US$)	Value/household (US$)
Purchased stock feed	3,747	4,388,039	2,345,259	625.90
Homemade feed	-		-	0
Home grown fodder	-		-	0
Veterinary services	3,114		314,292	100.93
Dipping levy	4,022		183,496	45.62
Vaccines	8,495		1,549,086	182.35
Detergents and disinfectants	5,198		779,662	149.99
Other	-		-	0
Total			5,171,795	1,105

TABLE 10: INPUTS PURCHASED BY A2 FARMERS 2014
Source: Zimstat (2015d:44)

Animal Health Workers

The current number of private qualified veterinary surgeons in Zimbabwe is estimated to be 21 veterinary businesses employing 164 people with an annual turnover of >Z$12 million (see Table 11). Anader (1997) suggested that there were 73 government officials, 121 private veterinary practitioners and 400 animal health assistants. According to the Division of Veterinary Services (DVS) there are 8 Provincial offices, 46 District offices and 412 local animal health centres in Zimbabwe offering farmers animal health support (DVS, 2017). Institut de L'Elevage (2013) reported a total establishment of DVS of 4,132 with staffing at 74%. However, significant shortages in key areas included epidemiologists (12.5%), animal health assistants (16%) and district veterinary officers (37%).

Animal health workers include vet officers. They follow a 5 years training in Harare at UZ (University of Zimbabwe). In the past, they were obliged to work few years for the public sector after their graduation. Now, this obligation is over and vets in the public sector are allowed to conduct parallel activities in the private sector. As an example one of the public vet that we met, receives payment for some specific services such as animal surgery, pregnancy diagnosis, sell of vet drugs or advices to A2 farms (A2 farmers are not supposed to benefit from public vet services) and pets owners.

Animal health workers also include Vet Extension Assistants (VEA) and Animal health inspector (AHI), they study during 3 years in a general agriculture college and then 2 years for an animal health specialization. The AHI are responsible for meat inspection and carcass grading; the VEA are in charge of the supervision of the dip tanks.

Function	No.	Annual turnover (Z$)+	No. of employees	No. of employees per business
Input				
Animal health workers#				
Private veterinarians	21	12,129,761	164	8
Government veterinarians	70			
Animal Health Workers/ CBAHW	400			
Sub total	491			
Agrodealers*	136	352,956,222	4,421	33
Breeders^	97			
Feed manufacturers@	16	1,072,000	600	30
Producers				
Fully commercial	17,700			
Commercial/communal	149,106			
Fully communal	527,104			
Intermediaries				
Traders/middlemen**	1,160			
Auctions	3			
Processing				
Meat processing	30	3,244,898	195	18
Abattoirs	122			
Retail				
Rural butchers##	2,400			
Butcheries, shops & supermarkets	1,860	193,022,597	5,671	3
Canteens, restaurants & institutions	2,026	1,212,575,219	12,609	6
Informal retail	30,000			
Total	732,742	1,773,928,697	23,060	67

TABLE 11: NUMBER OF BEEF VALUE CHAIN BUSINESSES BY TYPE
Source: adapted from ZIMSTAT pers comms, January 2018

Notes:
+ These figures are a little misleading: they are for the number of businesses surveyed by Zimstat. We believe this to be an underestimate in many cases, particularly the informal sector
# Animal health workers = veterinary businesses
* Agrodealers are a combination of wholesale and retail and include animal feed outlets. Some of this number may not be engaged in animal input dealing.
^ Chakoma, (2017) pers comms.
@ Estimated from information provided by the Stockfeed Manufacturers Association plus interviews. Nb: ruminant feed portion only.
** Estimated as abattoirs x 5
Estimated as the number wards in Zimbabwe (1,200) x 2

In a district like Chiredzi, there are 27 animal health workers, 27 dip tanks attendants, 2 animal health inspectors and 2 vet officers for 18,600 cattle owners (communal and A1) and 166,000 heads of cattle. This very low ratio can be explained by the fact that half of these cattle owners are A1

farms and veterinary services have not been re-sized to adapt to the consequences of the land reform.

Since recently, one Animal Health Worker (AHW) is attached to the AGRITEX (i.e. the agriculture extension services, that bring farmers support in crops activities) in order to deal with more general issues related to livestock. This structure (around 60 persons dedicated to animal health, and only one dedicated to more general livestock issues) shows the strong "veterinary health bias" in the support given to cattle owners.

In the absence of access to government animal health workers, there have been a number of community health worker development products that have trained groups of individuals to supply and administer veterinary drugs. The total number of these paravets is not known. Data for the number of extensionists in Zimbabwe is also not currently available. In the absence of government or non-government support, farmers turn to local informal, unqualified advisors. The extent of this is unmeasured, though some studies point to farmer access to Community Based Animal Health Workers (CBAHW) in the absence of government services being as high, with 45% of farmers adopting this approach in Masvingo Province for example (Mutambara et al, 2013)[13].

A typical Animal Health Worker draws a Government salary and provides free advice, but derives a small income from sale of veterinary drugs, which are purchased in bulk, divided and sold at a premium to farmers seeking advice. The great majority of beef farmers in Zimbabwe have no access to Animal Health Workers, so we make the assumption that a typical example would visit 15 farms a month, mostly on foot.

Where the collective animal dip tank is the place farmers receive advice from the animal health workers. In fact it seems that any service, outside the dip tank session, has to be paid by farmers. Any change in the composition of the herd of a farmer has to be registered on his/her stock card (birth, mortality, sale…) so that cattle movements are tightly controlled where this system is in operation.

Breeders

Zimbabwe had a strong tradition and reputation in cattle breeding mostly in former white farmer owned commercial land. A review of specific breeds across the internet shows that there are still a number of commercial Brahman breeding farms (43) and breeders of indigenous cattle breeds such as Tuli (11). Other commercially important breed such as Boran (12), Beef Master (3), Nguni (2), Simmental (6) and Mashona (3) may also have breeders.

It is estimated that there are 97 beef cattle breeders in Zimbabwe in 2017 (see Table 11), mostly selling to commercial farmers for stock improvement, but in some cases also selling to partially commercial/communal farmers and farmers who are not farming as their primary source of income (sometimes called 'weekend' or 'hobby' farmers in Zimbabwe).

[13] Important staff deficiencies were reported in other Divisions, for example only 35% of positions in port health and control are filled, the Department of Tsetse Control has only 75% of positions filled and the Department of Research is well under strength.

A typical beef cattle breeder specialized in selecting and selling high quality stock to commercial and, in some cases, partially commercial farmers, for stock improvement. We assume that they have a 200ha stock farmer and that they also do commercial beef/dairy farming which is captured elsewhere in this analysis. A cattle breeder keeps a stable herd, taking off bulls, selling older cows and bringing in heifers and bulls.

Agrodealers

The category of stakeholders sells veterinary medicines, remedies, food supplements, feeds different types of equipment (syringes, de-horning tools, etc). The most important element of agro-dealers business as far as beef production is concerned are drugs, deworming and dipping chemical for treating ticks.

Agrodealers form a sub-value chain consisting of[14]:

- Local drug manufacturers (Only one identified)[15]
- Large agro-input wholesalers (at least 10)
- Individual agro-input retailers (somewhere between 700 and 1,000)
- Veterinary practices with off-sales (unknown, but few)

District vet services used to officially sell drugs in the past, but now this activity is in the hands of AHW (see above) and of registered and numerous illegal drugs sellers. The illegal drugs market may represent more than half of the market (according to our interviews), this market is supplied by subsided veterinary drugs illegally imported from Zambia possibly including counterfeit drugs. In a district like Chiredzi there are 5 registered drugs sellers (for 18,600 cattle owners).

For the purposes of this analysis we have conflated the range of different agro-dealer types and sub-categories into a notional typical agrodealer. This dealer, based in a rural town or nodal point, offers a little of everything including seeds, agricultural chemicals, veterinary remedies, farm equipment and feed. Zimstat suggests that there are 136 such businesses in Zimbabwe (see Table 11 above).

Feed manufacturers

Animal feed manufacturers are generally termed 'stockfeed' manufacturers in Zimbabwe. The Stockfeed Manufacturers Association (SMA) reported 22[16] members in December 2016, not all producing beef feeds (we estimate 16). A very small proportion of beef producers use supplementary feed and this is reflected in the small proportion of total feed production (14.5% or 25,356 tonnes of total production of 174,274 tonnes[17]). By far the most popular feed is beef pen fattening ration (18,341 or 73% of all beef feed production). Of less important is beef maintenance feed (13%) and beef concentrate (14%). Sales of stockfeed show distinct seasonality, with higher sales in the period October to December toward the end of the dry season.

[14] Information estimated based on Maunze (2012)
[15] The Chemplex Corporation manufactures dipping chemicals and chemical fertilizers
[16] The SFA report 23 companies operating in Zimbabwe of which only one is not a member of the Association
[17] Figures from SFA (2016)

Stock feed sub-value chain and typology consists of:

- Small feed companies
- Large scale companies integrated into grain processing operations
- Stover, silage, suppliers (none identified)

A typical feed manufacturer produces about 300mt per day of mixed feed of which about 10% is for beef rations and employs between 30 and 40 permanent workers, who work a small proportion of their time on ruminant feeds.

For Input Suppliers the destination of production and estimated share of the step in the beef value chain is shown in Table 12.

Input	%	Destination
Animal health worker (including veterinarians)	72.2	Fully communal farmer
	21.9	Partially commercial/communal farmer
	5.9	Fully commercial farmer
Breeder	20	Partially commercial/communal farmer
	80	Fully commercial farmer
Agrodealer	20	Fully communal farmer
	40	Partially commercial/communal farmer
	40	Fully commercial farmer
Feed manufacturer	5	Fully communal farmer
	20	Partially commercial/communal farmer
	75	Fully commercial farmer

TABLE 12: SHARE AND MARKET DESTINATION OF INPUT SUPPLIERS
Source: Interviews

Producers

As explained above the farm economy in Zimbabwe is complex and diverse. Importantly, it has in recent times been largely defined by various resettlement of former white owned commercial farm land. Here we simplify this by proposing three broad categories of beef farmer: fully communal, partially communal and fully commercial (see T above).

As mentioned above there is a fourth category of beef producer in Zimbabwe, those that could be cattle owners but who lack the resources to enter this realm. There is probably a substantial population of small scale and communal farmers who are either in transition from not owning animals to owning animals or are selling off animals to address pecuniary need.

Cattle ownership is linked to the domestic cycle. Indeed there is a correlation between farmers age and cattle ownership (Muvirimi and Ellis-Jones, 1999, Scoones 1990 and our interview). Typically, first cattle are acquired after a period of paid work in agriculture or non-agriculture sector (sometimes associated with migration) or a period of employment as a herder (herders often receive calves for payment). When young farmers settle down, they have very few cattle and consequently limited draft power. Then comes an accumulation period as long as herds are not hit by drought

and diseases. During this period, some cattle are sold mainly to pay school fees of growing children. The herd size can reach a peak when farmer is 40-50 years old. Then, as the head of the household gets older the number of cattle decreases since animals are given for the 'lobola' (bride price) to the sons or slaughtered for funerals. Heads of cattle can also be loaned out to friends and relatives, as a kind of an informal system of assistance. Absence of cattle in a farm is then rarely a choice. In Chiredzi district, only half of the farms possess cattle (18,700 cattle owners for 37,600 rural households). This proportion is confirmed by different baseline surveys (40 to 60%).

We recognize that this non-cattle owning population of small scale farmers is important, but do not address them in this analysis. Future VCA4D may find that changes to the cattle owning population at this margin say much about income distribution and resilience in Zimbabwe.

Fully communal farmers: These are farmers on open communal land who keep cattle for a range of purposes including, consumption, herd growth, sale for cash need (e.g., school fees), draught animal power, milk and manure. Animals are also kept for social value including as saving, for traditional gifting and celebrations, as well as for status. Cattle are traditionally grazed in open shared land, and kraaled at night. Around 3.7 million animals are kept this way (72% of the total national herd) by 82% of the farm households who typically own 3-5 animals[18]. There are sub-sets of larger ownership within this category, but they represent a small proportion of the total population.

Communal farmers have limited marketing choices, often driven by a need for cash rather than profit maximization. A high proportion of animals sold from this category of actors is of very low grade, has poor conformity, is small (and therefore is disadvantaged by the animal grading system used in Zimbabwe[19]) and has an unusable hide. Sale to peripatetic independent middlemen (see Table 13 below) and at abattoirs where price formation may not always be optimal is the norm. Interviews suggest that illegal/informal inter-household sales and transfers are also much more common but are unrecorded. Partially communal/commercial farmers also procure stock from communal farmers, but statistics for this are not available.

[18] MIC (2017:13) shows that communal herds in Matabeleland North are characterized by large numbers of small herds with 52% of farmers having 1-5 animals and 29% with 6-10 animals.

[19] In Zimbabwe, carcasses are classified in "manufacture, economic commercial, super". This meat grading standard is based on a high weighting on fleshing index, a carry-over from the previous focus on export markets. The grading system seems to disadvantage indigenous or mixed breed animals over improved breed large animals with a higher saleable meat ratio to body size/weigh t. Price per kg of carcass can vary from 1 to 2 according to the grade.

FIGURE 12: INTERVIEWING COMMERCIAL FARM WORKER
Source: Photo credit, Ben Bennett

MIC (2017) calculates that the 'sales rate' (e.g., off-take) of animals from farms in Matabeleland is 8 per year with a home slaughter rate of 1.17 and a purchase rate of 1.15. This gives net off-take as 8.02 heads per year. The study shows that sales of more than 5 heads a year are rare and nearly half of all farmers did not sell at all in the past 12 months.

Sales of and product destinations for different farmer types are summarized in Table 13.

Producer	%	Destination
Fully communal farmer	30	Gift/own consumption other communal farmer
	20	Rural butcher
	10	Trader/middleman
	15	Abattoir
	20	Auction
	5	Partially communal farmer
Partially commercial/communal farmer	20	Gift/own consumption other communal/commercial farmer
	20	Trader/middleman
	10	Auction
	40	Abattoir
	5	Fully commercial farmer
	5	Rural butcher
Fully commercial farmer	10	Gift/own consumption other commercial farmers
	45	Auction
	45	Abattoir

TABLE 13: SHARE AND MARKET DESTINATION OF PRODUCERS
Source: Interviews

Partially communal/commercial farmers: this broad category includes a range of farming types whose characteristics are that they keep cattle on a small scale (3-7 animals) and so might be described as 'emerging commercial' or 'small scale commercial' at one end of the scale (say with 10+ head) or as sub-commercial but on a farm that has a mixed commercial/communal objective. This type of farmer uses all of the options available for on-sale including traders and independent middlemen,

auctions and abattoirs. It is estimated that about 227,000 households fall into this category (17% of cattle owning households) but that they own 22% of the national herd.

Fully commercial farmers are those that have the sole aim of maximizing their profit from beef production. These farmers can be small scale by international standards. Their total number is small (11,000 households, less than 1% of the farms) and their total proportion of the animal herd is now also relatively small (6%), an important structural change to the beef economy in the past 20 years.

Fully commercial farmers buy stock from partially communal farmers, for example steers for fattening. They also sell heifers to communal farmers (or exchange them for steers). They also do specialized production such as breeding and feed lotting, although these would seem to be a small proportion of the total. Commercial farmers do not sell to independent middlemen, but trade at larger auction, sell to abattoirs or directly to butchers where higher prices can be obtained.

Transporters

Live animal transporters are service providers in this analysis, and so, strictly speaking are not included in the functions. However, we offer the following insights from interviews because they are useful for understanding this aspect of the value chain.

Two categories of transporters exist in the beef value chain: live animal transporters and meat/meat product transporters. Within the live animal transport category to types were identified: specialist live animal movers with trucks for >10 head of cattle; and, smaller owner operated transporters using various kinds of pick-ups and small trucks with <10 head of cattle. We assume that the proportion of large to small is: communal = 100% small, partially communal = 50:50 small to large, and commercial = 100% large trucks.

A 'typical' small-scale transporter operates only one truck, often as part of a larger vehicle maintenance business. Trucks (either small, 3.5mt or medium, 7-8mt) are purchased second-hand and converted for cattle carrying in-country with the addition of frames. A typical 3.5mt truck can carry an average of 9 animals per load depending on the animal size.

FIGURE 13: AD HOC ANIMAL TRANSPORT IN RURAL AREAS
Source: Photo credit, Charles Chakoma

Large-scale transporters are now limited to a very few operators of medium sized trucks (7mt) with trailers (5mt). Most large-scale transporters have trucks that can convert to flat-bed for alternative use. Other than a few factories, there are almost no 20Mt+ trucks for live animal transport left in the country.

A 'typical' larger scale transporter operates a small (4-5 vehicles) fleet of 7mt trucks and 5mt trailers that can take 14 and 12 cows respectively (so 26 cows on a full load). A truck will do around 15 loads a month of around 400km round trip. It is suggested that only between two and five of this kind of transporter remain in Zimbabwe. The number of small-scale transporters is unknown. They are not centrally registered and have no association. We assume that they are numerous, but a separate survey would be needed to establish their number.

Downstream processors (abattoirs) commonly also offer a collection service for live animals at a fee. This element of the transport sector is, therefore, subsumed in the abattoir analysis

Intermediaries

Traders/middlemen

A typical trader/middleman works in a radius of 60 km and buys from 50 heads to 200 heads per month (with a peak season from June to December). He has a truck that can transport 4 heads of cattle (the cost for the transport of 4 cattle is estimated at 50$). But half of the time, when there is more than 15 animals to be transported to the abattoir the buying abattoir pays for the transport costs or arranges the transport.

Middlemen play a key role in a context of lack of cash as was the case during this research. They buy cash on a parallel market (we estimate that the exchange rate from "plastic cash" or "Ecash" to

cash is 1.2 (cost of 20%), although this varies are we can be as high as 1.4). The middlemen pay farmers in cash and are paid in "Ecash" by the abattoirs. The cost of buying cash represents an important charge for the middlemen.

Other costs are related to fees for the vet services: sale permit (Z$10 per batch), meat inspection (Z$2 per animal)], and police clearance (Z$10 per batch).

There is also a governmental tax (ZIMRA, 10.5% of the value of the animal, paid by the buyer). This tax is paid at public auction. Now that most of the sales are done through middlemen and abattoirs, it is unclear if this tax is to be paid by abattoirs or by middlemen. In Chiredzi district, local authorities sue abattoirs since they refuse to pay this tax (abattoirs pretending to buy meat to middlemen, not animals).

According to our interviews, from 2005 the number of middlemen have multiplied. It was a very profitable activity before the shortage of cash. (In Chiredzi district there are 20 middlemen, for 18,700 communal, A1 and old resettlement farms)

The number of middlemen is estimated to be 1,160 (e.g. the number of Districts (58) x 20 per District). The share of the market is somewhat hard to ascertain, but by cross-referencing from linked statistics we consider that middlemen mostly sell to abattoirs. The share of destination for this actor is shown in Table 14.

Intermediary	%	Destination
Trader/middleman	80	Abattoir
	20	Auction
Auction	10	Fully commercial
	10	Partially commercial/communal
	70	Abattoir
	5	Trader/middleman
	5	Rural butchers

TABLE 14: SHARE AND MARKET DESTINATION OF INTERMEDIARIES
Source: Interviews

Auctions

Zimbabwe has a strong tradition of using auctions to mediate agricultural sales, with three main companies involved in the cattle trade (CC Sales, Agricultural Auctioneers and CK Holland). CC sales are the market leader with 80% of the market (20,000 head in 2017 – a steady decline in numbers from 150,000+ head per year in 1999). The declining purchase of animal by CSC made auctioneers move into rural areas and increase purchases from communal and particularly communal farmer groups. Charges vary, but 6% commission on sale from buyer is common. In addition, Rural District Councils (RDCs) charge levies on auction sales from 2% - 8%. In Chiredzi, 10.5% of the value of the sold animal is paid by the buyer to the RDC, but only a share, 6%, is kept at RDC level, see above.

Estimated volume of market is less than 10% of total farmer sales. DLPD Meat Graders estimate that 7.3% of abattoir cattle slaughters come from auctions with the remaining 92.7% being direct sales of one kind or another (USAID, 2016:45).

The buyers at auctions are: rural butchers, cattle farmers aiming to increase/improve/restock (both fully commercial and partially commercial/communal), abattoirs and traders/middlemen.

Movement restrictions and market concentration (the Mt Hampden auction seems to be the market price maker with the largest number of cattle sales) have focused the sector within the 'green' and partially restricted zones with a varying number of peripatetic auctions filling in the gaps.

Farmers said that they prefer selling their animals at auctions since they can get a better price due to competition between buyers, compared when selling directly to middlemen. A major problem, however, is the transport of animals to these public auctions. Abattoirs are not in favour of public auctions and argue that prices paid for farmers at public auction are lower since buyers pass on farmers the cost of the fee to be paid to the RDC.

A typical auction operates 4-5 days a month and turns over between 600 and 800 animals. The share and destination of product from abattoirs is show in above.

Processing

We divide processors into abattoirs, where live animals are slaughtered and processed, and meat processors where animal products are converted into high value foods such as sausages, polonies and pies.

Abattoirs

The abattoir sector has seen important changes in recent years, reflecting the new dynamics of Zimbabwe's cattle sector. In the past, much of the off-take from the formal sector passed through the Cold Storage Company (CSC) and was destined for various forms of processing export at advantageous prices. More recently, numerous small, private abattoirs have opened responding to demands for slaughter from smaller scale producers. The Directorate of Livestock Development and Production (pers com) describes three main categories of abattoir: Large commercial (>500 head per day), Small commercial (<100 head/day) and Small (say 5 animals per day). In addition, farmers said that unrecorded and illegal on-farm slaughter is common. Large commercial abattoirs buy from auctions, use agents (sometimes called 'runners') and accept direct delivery by farmers. The common practice for larger abattoirs was to absorb the cost of cattle collection by retaining the value of the 5th quarter. Small commercial abattoirs are the grow sector in Zimbabwe. Most are operating on a 'toll' basis with animals slaughtered against a fee, and with retention of the 5th quarter and the hide. For large and small commercial abattoir delivery to wholesalers and to a range of different retail buyers (supermarket, butchers, catering services and institutions) is normal. Smaller abattoirs/butchers operate in rural areas and near towns. Many of these were involved in supplying farm workers, but have now adjusted to new market conditions.

Farmers selling their animal directly to abattoirs complain of unfair transactions, particularly that the grading system is not only adapted to local breeds and that the grading process lacks transparency. Farmers usually do not know the price that they will receive for their animal before

it is slaughtered, since it depends of the carcass grading. This grading is done by the meat inspector inside the abattoir, in the absence of the farmer for reasons of hygiene.

Zimbabwe had 161 registered abattoirs in 2013 (Institut de L'Elevage, 2013:58). ZAA (2017) report 122 licensed abattoirs with a capacity of 3,710 cattle per day[20]. There are others, but no data is available. In recent years the sector has been characterized by: very low capacity utilization, a switch from larger, centralized facilities to smaller regional abattoirs, and, a change in abattoir business model from buying and slaughtering to 'toll' slaughtering against a fee. This de-concentration and de-integration reflects the sectors response to the challenges faced in the macro-economy.

Registered abattoirs have to meet public health and environmental standards and apply the national meat grading standard based on a high weighting on fleshing index, a carry-over from the previous focus on export markets. The grading system seems to disadvantage indigenous or mixed breed animals over improved breed large animals with a higher saleable meat ratio to body size/weight[21]. The average carcass weight of animals slaughtered in Zimbabwe has declined from 200kg/animal to 167kg/animal reflecting changes in the genetics of the national herd and in the objectives for the farmers delivering to abattoirs (e.g., older and smaller animals).

Table 15 shows the share and market destination of products from beef cattle processing.

Processing	%	Destination
Abattoir	20	Meat processor
	50	Supermarket, shops and butchers
	25	Canteens, restaurants and institutions
	5	Informal retail
Meat processor	70	Supermarket, shops and butchers
	15	Canteens, restaurants and institutions
	15	Informal retail

TABLE 15: SHARE AND MARKET DESTINATION OF PROCESSED MEAT PRODUCTS
Source: interviews

Pricing strategies vary by abattoir. Some charge a flat toll fee (e.g., $25 per head), whilst others are charging a slaughter fee and retaining the 5th quarter (e.g., total $60-70 per head). ZAA (2017) assess that demand for beef is somewhere between 2,700 and 3,500mt per month at an average wholesale price ex factory of around $3.75 per kg.

Wholesale prices for meat products processed through an abattoir are not a constant. For abattoir profitability, much depends on the relative proportions and values downstream of different cuts and the ability of the abattoirs and butchery staff to maximize this number of higher value cuts and minimize the low value cuts. This in turn is a factor of the animal quality and conformity when presented at the abattoir, the skill of the meat worker, and to an unknown extent, on the ability of abattoirs and meat wholesalers and retailers to gain maximum advantage from the numerous

[20] Assuming 220 days per year maximum operation this gives a national cattle slaughtering capacity of 816,200, approaching x4 the actual throughput.
[21] New grading and carcass classification systems are under consideration and a regional solution has been proposed (Chingala et al, 2017).

different market segments for different meat cuts. In Zimbabwe, cuts from commercial abattoirs are divided (from highest value to lowest) into 'Supers', 'Choice', 'Commercial', 'Economy' and 'Manufacturing'. This proportion is shown in Figure 14 which illustrates the high proportion of low grade animals arriving at abattoirs. Commercial, Economy and Manufacturing represent nearly 70% of total throughput in these establishments. A weighted average was used for the operating account.

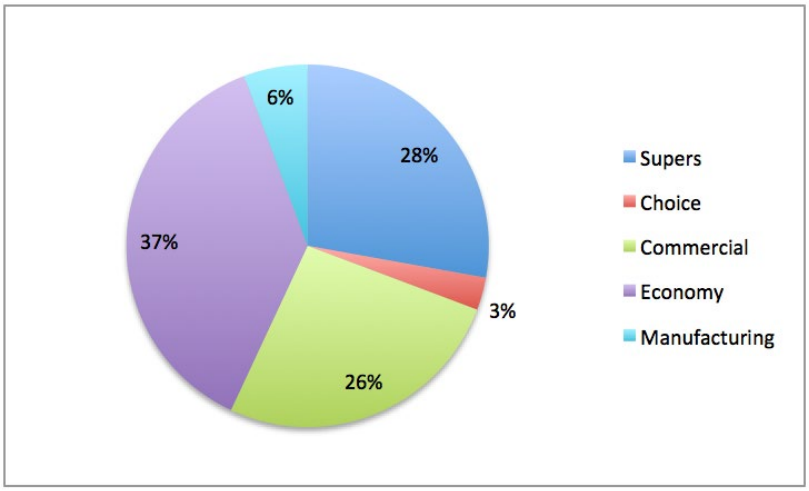


FIGURE 14: PROPORTION OF ANIMAL TYPES AND CUT QUALITY AT ABATTOIRS
Source: ZAA (2017)

Most abattoirs also offer a live animal collection service and keep trucks for this. Interviews with live animal traders/middlemen showed that about 50% of animals that pass through this route are picked up by abattoirs and purchased at a 'collected' price.

After leaving the abattoir meat and meat products become significantly differentiated. Typically, the sector considers the animal to be in 5 "Quarters". Quarters 1 – 4 consist of different meat cuts taken from a dressed whole carcass. A typical abattoir sells whole carcasses but this varies with larger operations being more integrated. Recent abattoir growth has been in the smaller abattoirs that sell whole carcass.

The remaining material is usually referred to as the "5th Quarter". This consists of hides, visceral fat, feet, the head and visceral organs. ZAA (2017) estimate this part of be worth around $90 with a particularly high value for poorer consumers. An element of the 5th Quarter is blood and bones. There do not seem to be any rendering plants working in Zimbabwe so no blood and bone meal is being used. The disposal of this material is a matter of considerable environmental concern.

No data is available on the destination of carcasses and the "5th Quarter" from abattoirs. In Chiredzi district more than 80% of the carcasses produced by large scale abattoirs (1000-1500 heads/month) are sent to supply the major cities (Harare, Mutare, Kwekwe…) but an important share of the offal (up to 60%) stays for the local rural market.

A typical abattoir for the purpose of this analysis purchases and slaughters 50 head of cattle a day and distributes to meat processors and a range of all the different retail outlets. Many abattoirs

undertake the wholesale function in Zimbabwe and we believe that this function has been subsumed at the Processor level of the value chain.

Meat processors

Zimbabwe has a substantial amount of meat processing infrastructure most of which is now under-utilised. The recent ban on imports of mechanically deboned meat (MDM), a key ingredient for many processed meat products like sausages and burgers, is severely limiting production of these products. The export for canned beef, once an important source of forex, has now stopped, with only a very limited amount produced for domestic markets and, therefore not included in the financial account developed for AFA.

Processors buy meat and meat parts from larger abattoirs, add them to imported ingredients such as casing and MDM, and make various products for supermarkets, caterers, institutions, butchers and directly for consumers. Products include: packages meat cuts, sausages and polonies, meat pastes and canned meat of various kinds.

A typical meat processor makes a range of meat products (including lamb, chicken and beef) with the largest part being burger patties and sausages of different kinds ('Russians', 'boerwors', 'droerwors', etc.). The products are distributed to retail meat outlets, some of which seem to be owned by meat processors as part of their vertical integration[22].

We estimate that there are 11 formal meat processors in Zimbabwe. However, interviews suggest that these statistics greatly underestimate the scale of the sector. In particular, the smaller scale 'sausage and pie' manufacturing sector is currently quite buoyant. Interviews suggest that there are between 20-30 such businesses in Zimbabwe and that of the 11 large businesses, not all are functioning. We estimated a total of 30 'typical' meat processing businesses are in operation.

Retailers

We identified four types of retail outlets: rural butcher; supermarkets, shops and urban butchers; catering, restaurants and institutions; and, informal meat retailers. These actors buy bulk meat and meat products and sell them on to consumers in a variety of forms and locations (see Table 11 above).

Supermarkets, shops and urban butchers

In urban areas like Harare, supermarkets sell meat products and cuts that they buy from abattoirs and meat processors. Proportions of these destinations are shown in Table 16 below. Typical supermarkets sell a range of meat products from in store butcheries through prepacked cuts to meals and pies[23]. The Zimbabwe supermarket sector is divided into foreign owned chains such as 'Pick 'n Pay', 'Shoprite' and 'SPAR', and locally owned chains such as 'OK Zimbabwe Limited', 'TM Supermarkets', 'Afrofoods', 'Batanai Supermarkets' and 'Savemor Supermarkets'. The foreign chains,

[22] Nb: For AFA modeling we assumed that the businesses were separate.
[23] Nb: For AFA modeling we used sausages, the largest processed meat segment, as a proxy for these products

mostly South African owned, have seen competition in recent times from Chinese-Zimbabwean join ventures like Horizon Ivato Zimbabwe (HIZ). There are also legacy 'mom-and-pop' type family owned supermarkets.

Retail	%	Destination
Rural butcher	100	Consumers
Supermarket, shops and butchers	20	Canteens, restaurants and institutions
	10	Informal retail
	70	Consumers
Informal retail	100	Consumers

TABLE 16: SHARE AND MARKET DESTINATION OF RETAIL OUTLETS
Source: Interviews

We estimate that Zimbabwe has 1,860 formal outlets retailing meat and meat products. (see Table 11 above). Zimbabwe has a range of different butcheries. A butcher receives carcasses from abattoirs, divides it into cuts and retails these to consumers. Butchers in Zimbabwe are regulated and certified/inspected by local government. They range from high quality up-town butcheries to small rural butchers with a fridge and a cutting table.

a. Larger butcheries (e.g., Bulawayo Meat Market) sell retail and also do catering and institutional deliveries.

b. Smaller butchers buy animals from abattoirs and sell mixed beef cuts.

c. In store butchers in supermarkets.

d. Very small butchers who buy individual animals from farmers and slaughter without facilities (sometimes called 'pole butchers).

For the purpose of this functional analysis we have decided on two categories:

<u>Supermarkets, shops and butcheries.</u>

These are formal butcheries with a license to operate and normal meat management facilities (cold stores, chillers, mincers etc.). They are normally based in urban and peri-urban areas. This group buys meat carcasses from abattoirs, meat processors and wholesalers, divides it into 'cuts' and retails directly to consumers in various forms.

A typical example of an in-house or independent butcher/retailer turns over about 80kg of beef a day depending on location and size. Those interviewed suggested that higher beef turnover might be expected in high-end supermarket butchers or city center outlets of butchery chains, but this declines with the socio-economic status of the locale.

ZIMSTAT estimate that there are 1,860 such establishments in Zimbabwe, employing 5,671 staff with a typical turnover of Z$103,776 per annum (see Table 11 above)

Rural butchers

We estimate that 20% of all communal farmer sales in Zimbabwe pass directly to rural butchers where they are slaughtered and cuts sold to consumers[24].

FIGURE 15: RURAL BUTCHERS PRICE LIST, OCT 2017
Source: Photo credit Ben Bennett

A typical rural butchery (from our interview in Chiredzi) slaughters 2 to 4 animals per month. Animal are purchased from neighboring communal and A1 farms, at an average price of Z$450. On average, these animals produce a carcass of only 140 kg (sold to final consumers in average at 4 to 5 Z$/kg) and 18 kg of offal (sold at Z$3/kg). Head is sold for Z$10 and each foot for Z$1. Butchers can also buy carcasses in large scale abattoirs, at Z$3.2/kg.

The seller is also the blockman. He receives Z$170 per month (and claims to work 7 days/week, 11 hours a day). Clients are rural families, buying meat in average once or twice a month, a quantity of 3kg of meats and/or offal (for an average family size of 5 persons).

[24] Projected from MIC (2017)

The number of rural butchers is not collected, but we estimate there to be at least 1,000 (see Table 11 above)

Catering, restaurants and institutions

Catering refers to companies that buy a range of food and then sell meals to consumers. This included an array of different actors including: restaurants, hotels, fast food outlets and institutions.

Caterers also provide services for large events and functions such as weddings and funerals. Decline in tourist visitor numbers, which was nearly 2.5 million per annum in 2006, has reduced this trade, but some recovery was seen in 2016, to 2,164,000 a year with substantial growth expected. This sector, therefore, represents an important area for beef demand, particularly at the higher end of the quality spectrum.

Zimbabwe has a number of important institutional meat buyers. In the public sector, meat and meal provision is tendered for a range of bodies including the army, prisons, hospitals and schools. Another important source of demand is the mining sector. ZIMSTAT (2015e) estimate the number of miners in the formal sector in 2013 to be 23,616. The Ruzivo Trust (undated) estimate that there are 100,000 informal small scale miners. Actors interviewed for this study put this figure at nearer to 300,000. This is, therefore, an important (but unmeasured) source of demand for meat from butchers and processed meat.

The catering sector also includes fast food chains, small restaurants and food outlets and informal restaurants. The availability of cheap chicken meat has led to changes in this sector, with notable growth in different types of chicken based fast food outlets.

ZIMSTAT (pers comm) suggest that there are 2,026 businesses in this category employing 23,060 people and having an average turnover of Z$598,507 per business (see Table 11 above).

A typical catering service provider purchases about 9 carcasses a month from an abattoir or a wholesaler. In some cases, meat processors, abattoir owners and meat wholesalers also own food outlets that involve selling meat. However, for the purpose of modeling this value chain we are proposed a nominal restaurant 'business' as a proxy for a range of different catering establishments.

Informal retail

Recent studies show that Zimbabwe has one of the largest percentages of informal business in the world at >60%. Increasingly there is an emerging unregulated informal meat-selling sector in Zimbabwe. In cities, informal street sellers buy meat from abattoirs and repackage into Z$3 'bags' of mixed meat. Interviews with butchers show that, in urban areas there is a large 'tray' trade. This consists of individuals who buy a 'tray' of mixed cuts from butchers and hawk these to homes. The recent ban on polystyrene tray use for health reason has increase the operating costs of these businesses considerably as vendors have to switch to much more expensive imported alternatives (Machamire, 2017).

Informal meat selling may be related to stock theft issues.

Consumers

A national consumption survey to assess food consumption and in Zimbabwe trends is lacking. Zimbabwean consumers have a very low purchasing power and food poverty is widespread: Zimbabwe ranks 156 out of 187 countries on the Global Hunger Index.

Meat consumption is low. According to data provided by the Zimbabwe Association of Abattoirs, meat consumption is around 16 kg/pers/year. On 2007, beef meat represents 51% of this meat but dropped to 31% in 2016 in favour of chicken meat (see Figure 16).

Other source (Institut de L'Elevage (2013:76) reports that beef consumption in Zimbabwe, once the highest per capita in the region at 13kg has now fallen to 3.8 kg.

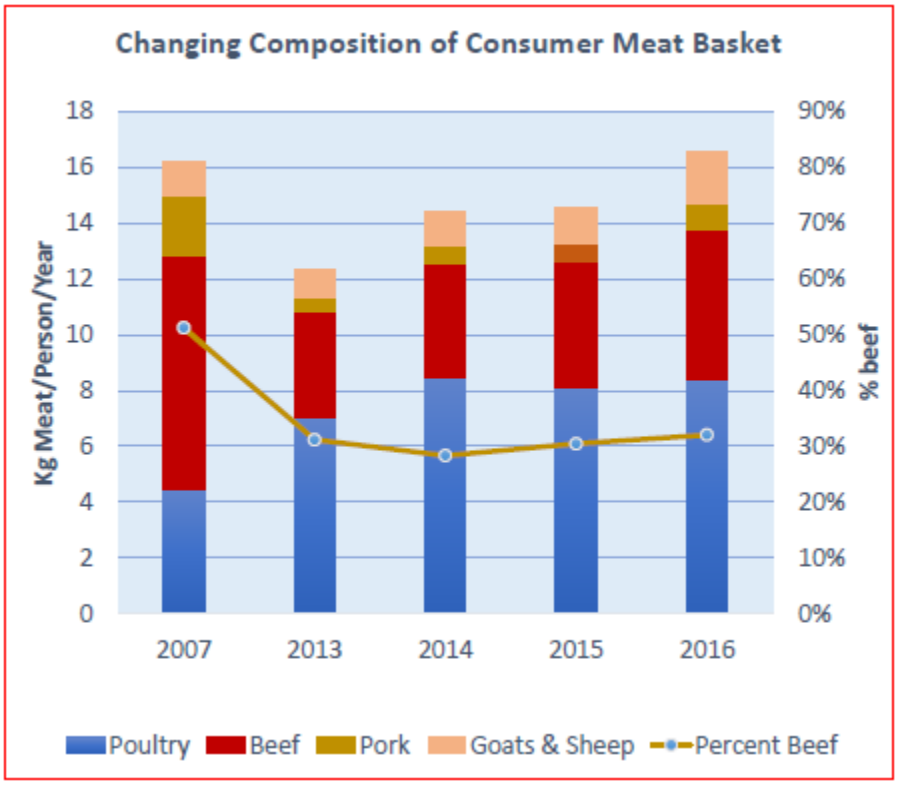


FIGURE 16: CHANGING COMPOSITION OF CONSUMER MEAT BASKET
Source: Zimbabwe Association of Abattoirs, 2017

As mentioned above, consumption of beef and beef products is underestimated since it is based on carcasses. Offal, heads and feet are not taken into account. If we consider an average weight of 167kg per carcass and 18kg of offal by carcass, this means that beef consumption is underestimated by more than 10%. Moreover, as mentioned above, the informal meat market has increased.

Based on our interview with rural women and rural butchers, we assess that families on average consume meat twice a week, mainly from home raised chicken and goat. Consumption of beef meat

is less frequent (once a week to once a month) and always based on purchase. A family of 5 persons buys an average of 1 kg per purchase, most frequently offal. This gives an estimated consumption of beef (meat and offal) in rural areas, of 6 kg of beef/cap/year. This does not take into account consumption outside of home. Many roadside restaurants offer cheap meals of 'sadza' (cooked maize meal) with beef offal for Z$1 per plate.

Milk consumption (principally cow milk) is around 30 l/pers/year (according to FAOSTAT 2013). Higher prevalence of cattle in the household does not lead to higher consumption of beef meat (as might be expected for poultry for example), but leads to a higher consumption of milk, in particular during the rainy season (from December to May).

Sub chains

The status of sub chains and by-products for beef depends upon the farming system. For commercial farmers manure and draft power are unused. However, for communal and commercial/communal farmers these are a main production purpose. This should be born in mind when considering this section.

Hides and skins

The most important by product user in Zimbabwe is the hides and skin industry. A summary of the volume and value of hides exported between 2004 and 2013 is shown in Figure 17. Most hides are wet/salted with a limited shelf-life. After a number of years of almost no exports, it can be seen that there was recovery up to 2013, demonstrating the potential for the sector.

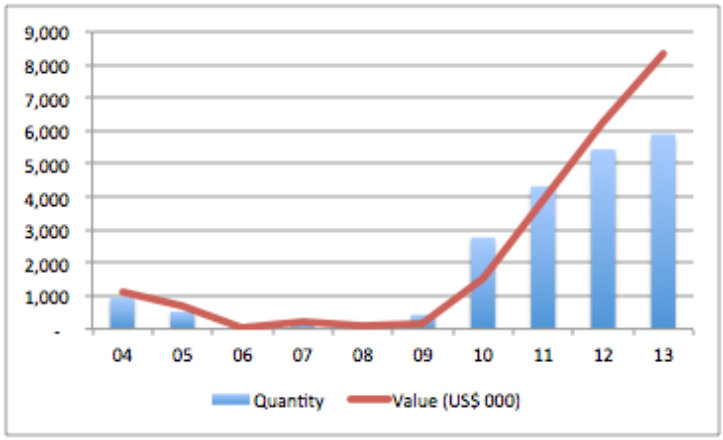


FIGURE 17: EXPORT OF CATTLE HIDES, 2004-2013
Source: FAOSTAT

At the time of the mission raw hides had almost no value at all largely due to low international prices for the low quality and small Zimbabwe hides, the collapse of the domestic leather sector as a source of demand, and a levy on export of raw hides of $0.75 to promote domestic processing which seems to be discouraging production. In addition, abattoirs complained that the smaller skins of animals slaughtered in the lower grade are of very poor quality and are hard to sell for export. Zimbabwe had a domestic tanning and leather industry that seem not to be operating at present.

In addition, there are several, largely unvalued, by products of cattle ownership that should be considered (see also the section technical diagnosis below). Barrett (1991) provided a framework for cattle functions in Zimbabwe's communal farmer systems (see Box 1)

Crop production
- Tillage (ploughing, ridging, weeding

Fertilizer (manure)

- Transport (inputs and products, wood, water etc)

Consumption
- Milk for domestic consumption, sale and exchange
- Meat, hides, horns and other by-products for domestic consumption and sale

Household finance
- Investment of crop income (capital growth through herd growth)
- Savings (capital storage for future use e.g., school fees, bride payments)

Social
- Ritual purposes (installation of ancestral spirits, ritual slaughter)
- Social status (social standing in communities related to animal ownership)
- Pleasure of ownership (hobbyists, part-time farmers)

BOX 1: A FRAMEWORK FOR CATTLE FUNCTIONS IN COMMUNAL FARMING SYSTEMS
Source: Adapted from Barrett (1991) and Scoones (1992).

2.2.2 Public sector

Zimbabwe's has 21 key public institutions (e.g. Ministries – see zim.gov.zw). For the beef sector the Ministry of Lands, Agriculture and Rural Resettlement (MLARR – formally Agriculture, Mechanization and Irrigation Development (MAMID) with its Departments of Livestock and Veterinary Services (DLVS), Agricultural Extension Services (Agritex) and Research and Specialist Services (RSS) are most important. Other Ministries that play a crucial role include: the Ministry of Environment, Water and Climate; the Ministry of Women and Youth Affairs, the Ministry of Industry, Commerce and Enterprise Development and the Ministry of Labour and Social Welfare. From an economic and trade perspective, the Ministry of Finance and Economic Development is also important. In terms of decentralised Government, the Ministry of Local Government, Public Works and National Housing also has an important role in the beef livestock sector.

Zimbabwe has a number of Government Parastatals that also have impact on the sector including the Grain Marketing Board and the Cold Storage Company.

The government and quasi-government institutions manage the full range of policy and regulatory functions for the beef value chain in Zimbabwe.

Other non-government stakeholders

Farmers and workers unions

There are four registered farmers' unions who represent different segments of the farmer's population. These Unions represent farmers in different instances such as the EC (Employment Council, previously known as NEC, National Employment Council); but their local implementation is weak. There are also farm workers unions. But trade unionism may be tough in Zimbabwe, in particular during election period (ILO, 2009) (see more detail in the social analysis, the section on social capital).

Banks

Access to credit and liquidity is a major constraint for the stakeholders of the beef value chain. The Agribank (officially the Agricultural Development Bank of Zimbabwe), is in charge of the agriculture sector. But its lack of fund and liquidity limits its capacity to fund agriculture activities and available funds are said to be siphoned off by elites with good connections (Scoones et al., 2010). Many commercial banks refuse agricultural loans without titled land (freehold tenure); this strongly limits access to credit for communal farmers, 99 years-lease A2 farmers and for all farmers who only have permit-to-occupy or those with no document at all. There is currently a debate on what would be the most appropriate types of land tenure (not necessarily freehold title according to Scoones, 2017) to ensure land security, and on the possibility to use others assets such as livestock to serve as a collateral (see Box 2 and for example the cattle identification programme below).

A survey conducted in 2015 in the framework of the "Feed the Future Zimbabwe Livestock Project" shows that 47% of the urban population has a bank account while a mere 12% of the rural population has an account (USAID, 2015). But many farmers had to open a bank account in relation with the recent cash shortage at national level. We estimate from interviews that currently 30 to 40% of farmers have a Bank account.

Microfinance institutions also offer short-term credits, sometimes with co-liability for loans payment. Interests rates vary from 3.5 to 5% per month. These loans often involve local NGOS (e.g. Credit Against Poverty-Masvingo (CAP), Dondolo Mudonzvo, Environment and Development Activities (ENDA), National Association of Cooperative Savings and Credit Unions of Zimbabwe (NASCUZ), Organization of Rural Associations for Progress (ORAP), Phakama Savings. These organizations act as conduits that receive money from donors and pass it to the poor people in the informal sector (Mago, 2013).

There are also some forms of "saving and lending schemes" organized at community levels, mainly involving women, and known as *isal,* with a mensual interest rates (based on our interview) of 10% per month (see "gender section" in the social analysis for more details).

April 2017: "Commercial banks in Zimbabwe will soon be compelled to accept livestock such as cattle, goats and sheep as collateral for cash loans to informal businesses under a new law presented to parliament Tuesday.
Under the Movable Property Security Interests Bill tabled for debate by Finance and Economic Development Minister Patrick Chinamasa in the House of Assembly, the Reserve Bank of Zimbabwe will compile and administer a collateral-security register in which small-business operators and individuals can register their movable assets as security for credit.
Vehicles, television sets, refrigerators, computers and other household appliances will become acceptable as collateral once they are evaluated and registered in the central bank's register, according to Chinamasa".

BOX 2. LIVESTOCK AND LOANS ACCESS

Source: https://www.bloomberg.com/news/articles/2017-04-11/new-law-to-compel-zimbabwe-banks-to-accept-cattle-as-collateral, accessed 22nd of March

NGO's and Donors

Until recently, the Development Partners support focused on humanitarian support to offset the food shortages that prevailed in the country (delivery of emergency food aid). With the improvement of the food supply situation, donor support has shifted progressively towards development aid. When it comes to cattle and beef, this aid is twofold: supporting the role of cattle in improving resilience to shocks such as drought; and, supporting the development of commercial activities, mainly through feed-lotting projects.

According to the Zimbabwe Agriculture Investment Programme Document (2013-2017), donor support in 2009-2010 reached USD74 million (Rep. of Zimbabwe, 2012). The main partners (EC, FAO, DFID and USAID) support the provision of seed and fertilizer to food insecure households, promotion of conservation farming, production of small grains and livestock, institutional strengthening, HIV/AIDS mainstreaming, and irrigation development.

The Zimbabwe Resilience Building Fund (ZRBF[25]) is supported by the Ministry of Agriculture, Mechanisation and Irrigation Development (MAMID), the European Union (EU), the Embassy of Sweden, the United Nations Development Programme (UNDP), and the Department for International Development (DFID, UK). It supports interventions that aim at achieving increased capacities of communities to withstand shocks and stresses. This includes support to livestock activities.

Another important support to livestock activities comes from EU-FAO funded Livestock Programme initiated in 2014 and implemented by MAMID in partnership with LEADs and HELP Germany. The project supports 40,000 farmers who practice mixed crop and livestock production in Matabeleland North Province. "The Feed the Future Zimbabwe Livestock Development Program" (2015-2020), funded by USAID is also supporting 3,000 beef and 2,000 dairy smallholder producers in Matabeleland North Midlands and Manicaland Provinces.

These projects focus on the food security and resilience of communal farmers. Areas of land reform tend to be excluded from donors support. The projects bring support in terms of agriculture

[25] http://www.zrbf.co.zw/, accessed 27th of March

services, extension, market access. They fill gaps in government services for example through extension services to cattle owners where these are limited and are frequently in the hands of the veterinary services and therefore focused on health issues (see above). NGOs also contribute to develop on-farm commercial activities through feed-lotting projects. Their presence, as intermediaries between, on one side farmers and on the other side credit institutions and middlemen, contribute to fairer transactions.

The new EU Programme (in the framework of the 11th European development Fund) is also in progress in order to support the Zimbabwe Agriculture Growth Programme (ZAGP); this includes supporting the contribution of the livestock sector to economic growth.

2.2.3 Key policies impacting on the beef value chain

Different policies have been designed since 2010 in order to adapt to the changes in the economic and agrarian context. These policies aimed at facing the challenges and seize the opportunities that these changes bring for the recent beneficiaries of land reform and for the other stakeholders involved in the livestock market chain.

Strategies and policies for livestock have been designed in line with the country's commitments to the Comprehensive Africa Agricultural Development Program (CAADP), and as part of the Comprehensive Agriculture Policy Framework (2015 – 2035), the Zimbabwe Agriculture Investment Plan (ZAIP) (2013 – 2018) and other related policies. These policies and plans recognize the potential of livestock, and in particular cattle, in reducing poverty and food insecurity and in contributing to agriculture development and economic growth.

The National Livestock Development Policy and Programme (2014-2018) is under the responsibility of the Ministry of Agriculture and Irrigation development (MAMID). It intends to support small stakeholder's integration in the market chain, by promoting indigenous cattle, developing livestock marketing infrastructure, particularly in remote areas, ensuring ethical business from private institutions involved in the livestock market chains and strengthening farmers' representation and bargaining power. Export markets and FMD control are not presented as major priorities. It is supported by the EU-Zimbabwe Agriculture Growth Programme (ZAGP) whose specific objective is to strengthen the framework of services for value chain development as well as invests directly into the development of high potential value chains including beef, poultry and animal feed.

In contrast, some policies are more directly oriented towards the objective of restoring Zimbabwe status of "Bread Basket of Southern Africa" and of major beef exporter. The Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZIMASSET, 2013 – 2018) was set up in 2013 as a reaction to the economic and social crisis. It involves directly the Office of the President and Cabinet (OPC). The Agenda intends to increase meat production by 400,000 tonnes between 2013 and 2018 (Rep. of Zimbabwe, 2013). A progress report published in 2017, however, showed on the contrary a decreased in the cattle herd (by 0.69% from 2016 to 2017) and in calving rate (from 46% to 45%). The success achieved in the Maize command agriculture program during the 2016/17 season has encouraged the government to extend it to other commodities, including livestock (the Command Maize Program is part of the ZimAsset, it is based on subsidized inputs and guaranteed purchase, see above).

In line with the "Command" Program, the Command Livestock, Fisheries and Wildlife program was approved in May 2017. The objectives are to improve the supply of animal-based products to meet national demand and be competitive to meet export demands. Funding is through a government guarantee for Z$300 million and will reach Z$432 million with private sector contribution. Farmers and other beneficiaries apply for financing through banks, and the loan tenure is for three to five years. It targets beef, dairy and poultry, and the production of associated equipment. Regarding cattle production, it also intends to re- establish the FMD Fences, dip tanks, watering points and other livestock farming infrastructure. It also plans to revitalize the Cold Storage Company. This Command program is quite controversial, particularly in the run-up to national elections in 2018. The Team also question its economic viability but have not been offered sufficient evidence to provide analysis at this stage.

The Government of Zimbabwe (GoZ) has not released any documentation (policies, guidelines or strategy) to support the Command Livestock, Fisheries and Wildlife programme, except for Statutory Instrument (SI) 79 of 2017. SI 79 of 2017 is administered by Agricultural Marketing Authority (AMA) and outlines the contracting arrangements to be followed by contracting companies and recovery of loans under the various Command programmes.

Recently (end 2017), a National Livestock identification programme has been launched based on a Public Private Partnership between MAMID and a private partner (Univern Enterprises). It entails having all Zimbabwean cattle tagged with an electronic RFID tag. These tags will bring extra charge for the farmer ($2 for the tag and $1 per year as a monitoring fee). This tag will facilitate recording of all activities related to the animal (including vaccination, dipping or movement in FMD area) and indirectly to its owner. It is also expected that it will facilitate farmers' access to loans using cattle as collateral.

The set of policies embracing the livestock sector also includes the Zimbabwe Leather Strategy (2012-2017) whose purpose is to revitalize the Zimbabwe's leather industry. The objective is to reverse the downturn of the sector (currently working at about 20% of its past level) associated to low price paid by hides' collectors. Other more specific policies intend to promote the involvement of women or youth in livestock market chain ("the National gender policy", "the National Youth policy", "the Agriculture gender policy"), but with no clear effective strategy. It is the same for "Prevention of Cruelty Act" administered by the Ministry of Environment for the promotion of animal welfare standards.

In fact, it is quite unclear, beyond these different national policies and programs, what is the present strategy adopted by the government in relation with export market and priority to be given or not to FMD control (in case of export towards FMD free countries).

2.3 Technical Diagnosis

2.3.1 Beef Production

Production conditions

According to Vincent and Thomas (1961) and Moyo (2000), five agroclimatic zones (also known as natural regions) can be considered on the basis of the rainfall regime, soil quality and vegetation among other factors (Figure 18).

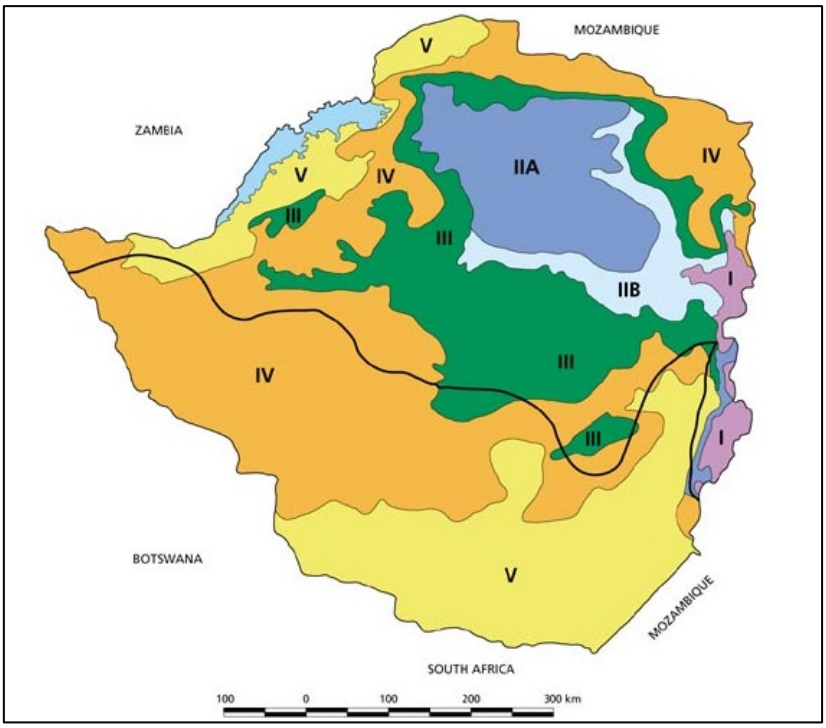


FIGURE 18: AGROCLIMATIC ZONES IN ZIMBABWE
Source: FAO, 2006

- Agroclimatic zone I: Relatively high elevation with cool temperatures and rainfall in excess of 1,000 mm throughout the year. Suitable for dairy farming forestry, tea, coffee, fruit, beef and maize production.
- Agroclimatic zone II: Relatively high elevation and concomitant cool temperatures with rainfall from 800 -1,000 mm concentrated in the five summer months from November to March. Suitable for intensive farming, based on maize, tobacco, cotton and livestock
- Agroclimatic zone III: Moderate and infrequent rainfall (500-800 mm/year) with relatively high temperatures. Subject to seasonal droughts and severe mid-season dry spells. Suitable for semi-intensive farming especially for livestock production, together with production of fodder crops and cash crops under good farm management
- Agroclimatic zone IV: Low and erratic rainfall (450 - 650 mm/year). Periodic seasonal droughts and severe dry spells during the rainy season. Suitable for farm systems based on livestock and resistant fodder crops and forestry

- Agroclimatic zone V: Low and very erratic rainfall (<450 mm/year). Extensive farming region despite of endemic tsetse fly. Suitable for extensive cattle ranching and forestry but also for tourism activities (wildlife).

Agroclimatic zone I: This zone lies in the east of the country. It is characterized by rainfall of more than 1 000 mm/year, most of which falling throughout the year, low temperatures, high altitude and steep slopes. The country's timber production is located in this region. The plantations are owned mainly by the State through the Forestry Commission and by multinationals. There are several small owner-operated plantations and sawmills. NR I is ideally suitable for intensive diversified agriculture and livestock production, mainly dairy farming. Common crops are tropical crops such as coffee and tea, deciduous fruits, such as bananas and apples, and horticultural crops, such as potatoes, peas and other vegetables. Flowers, such as proteas (Proteaceae spp.), are grown for export.

Agroclimatic zone II: This zone is located in the middle of the north of the country. The rainfall ranges from 750 to 1 000 mm/year. It is fairly reliable, falling from November to March/April. Because of the reliable rainfall and generally good soils, NR II is suitable for intensive cropping and livestock production. It accounts for 75-80% of the area planted to crops in Zimbabwe. The cropping systems are based on flue-cured tobacco, maize, cotton, wheat, soybeans, sorghum, groundnuts, seed maize and burley tobacco grown under dryland production as well as with supplementary irrigation in the wet months. Irrigated crops include wheat and barley grown in the colder and drier months (May-September). NR II is suitable for intensive livestock production based on pastures and pen-fattening utilizing crop residues and grain. The main livestock production systems include beef, dairy, pig and poultry. Prior to 2000, the region was dominated by the large-scale farming subsector characterized by highly mechanized farms of 1 000-2 000 ha under freehold title and owner-operated. Following the agrarian and land reform programmes initiated in 1999/2000, a large proportion of the farms were subdivided into smaller units and allocated to new farmers under the A1 and A2 small-scale farming system.

Agroclimatic zone III: This zone is located mainly in the mid-altitude areas of the country. It is characterized by annual rainfall of 500-750 mm, mid-season dry spells and high temperatures. Production systems are based on drought-tolerant crops and semi-intensive livestock farming based on fodder crops. The predominant farming system is smallholder agriculture. Large-scale farming accounts for 15 percent of the arable land production, most of the land being used for extensive beef ranching (Roth, 1990). Smallholder agriculture in the communal farming areas is under relatively intensive cropping systems. The main crops are maize (the staple foodgrain) and cotton (a major cash crop). NR III is suitable for the production of groundnuts and sunflowers as cash crops.

Agroclimatic zone IV: This zone is located in the low-lying areas in the north and south of the country. The characteristics of the region are: annual rainfall of 450-650 mm, severe dry spells during the rainy season, and frequent seasonal droughts. Although NR IV is considered unsuitable for dryland cropping, smallholder farmers grow drought-tolerant varieties of maize, sorghum, pearl millet (“mhunga”) and finger millet (“rapoko”). NR IV is ideally suitable for cattle production under extensive production systems and for wildlife production.

Agroclimatic zone V: NR V covers the lowland areas below 900 m above sea level in both the north and south of the country. The rainfall is less than 650 mm/year and highly erratic. Although NR V receives reasonable rainfall in the northern part of Zimbabwe along the Zambezi River, its uneven topography and poor soils make it unsuitable for crop production. Generally, NR V is suitable for extensive cattle production and game-ranching.

Although both agroclimatic zones IV and V are too dry for crop production, households on the communal lands in these regions grow grain crops (maize and millet) for their food security and some cash crops such as cotton. Crop yields are extremely low and the risk of crop failure is high in one out of three years (Rukuni and Eicher, 1994). Cattle and goat production are major sources of cash income.

Agro-ecological zoning

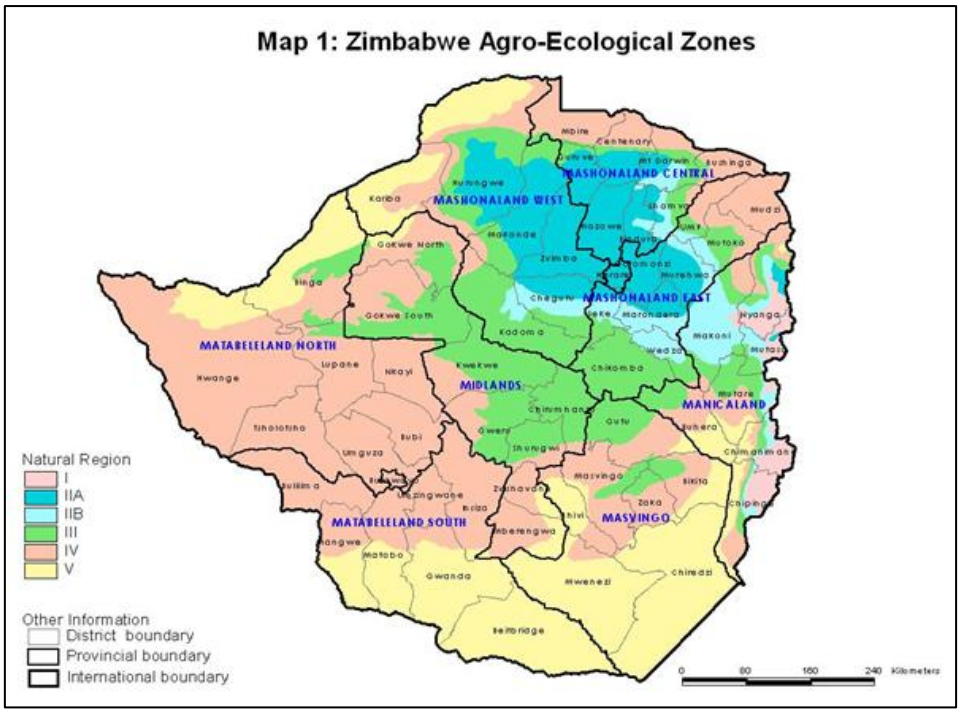


FIGURE 19: ZIMBABWE AGRO-ECOLOGICAL ZONES
SOURCE: FAO, 2006

2.3.2 Main functions of livestock/Products/ productivity

A value chain approach invites to focus on cattle as a commodity. But in the Zimbabwean context, cattle are much more than a commodity and have many over functions at farm level, such as providing draft power, fulfilling social obligations, saving, producing manure and milk and secondarily meat. These functions are detailed in the social analysis.

The share of these different functions (in value) has been assessed by Barrett in 1992 and Murvirimi and Ellis-Jones in 1999 (see Table 17). It shows the major importance of cattle as draft power. This data should be updated but more recent surveys (e.g. FAO, UE 2014) confirm that cattle is still considered by small-scale farmers as a fixed asset, rather than as an income source.

Output (% of value)	Cattle	Donkey
Draft	64	95
Milk	14	-
meat	4	2
Manure	8	-
herd growth	10	3-5
Social value	-	-
Total	100	100

TABLE 17: ESTIMATES RELATIVE ECONOMIC VALUES FROM CATTLE AND DONKEYS IN COMMUNAL FARMS AS A % OF TOTAL ECONOMIC VALUE

Source: Muvirimi and Ellis-Jones, 1999 (based on Barrett 1992) and own estimates.

Farmers have regularly been urged by government to increase cattle output and improve their contribution to the national market meat supply. Farmers' ownership of large herd of "unproductive" animals and the supposed "farmers' mentality" have been blamed since a long time in relation with government concerns on land degradation. Authoritarian destocking interventions have been implemented in the past. But the overview of the different functions of cattle that we have presented shows that cattle productivity should not be only assessed in term of off take and meat production.

Increasing the participation to the beef value chain supposed to favour the "income function" to the detriment of the others. There is then a need to address and resolve the numerous institutional failures (bank system, credit access, market organisation, extension services…), so that these functions can be assumed by others means than by cattle and so in order to reduce the risk for farmers to invest and specialize in "meat" production. The success of the pen fattening projects show that when these constraints are reduced, small-scale farmers can behave as dynamic economic actors (independently of their "supposed mentality"), including in the beef market chain.

2.3.3 Inspection; Levies/ Regulation

Formal regulation and levies associated with good order in production and marketing are normal within a well-functioning national and regional beef value chain. Maintenance of veterinary and health infrastructure and compliance with international law to contain disease transmission is normal and recovering elements of cost through charges to users rather than to society in general through taxation is prudent.

In recent times, Zimbabwe has developed an elaborate set of formal and, increasingly, semi-formal regulatory and compliance mechanisms. These policies go beyond normal domestic regulation as, in some cases, they seek to levy aspects of the value chain with the aim of redistribution of funds to fund other policy initiatives (including the 'Command' policies as outlined above). These levies and charges are a significant element of cost in the beef value chain (see Table 18). This analysis is derived from Chamboko and Erasmus (2014) and interviews conducted by the Team.

We note that in addition the Team found a range of other taxes and surcharges that impact on the sector but which were not included in Chamboko and Erasmus and for which, at the time of field analysis, implementation was unclear. For example, the EMA (Effluent and Solid Waste Disposal) Regulations of 2007 also applies to livestock processing plants including abattoirs and milk processors. Operators are required to pay an annual registration fee, inspection fees, and a

quarterly discharge fee for abattoir and milk processing wastes and boiler waste water. Also the tax on waste in slaughter houses, including a surtax of $0.75 per kilogram on the export of raw hides and skins produced at abattoirs in order to encourage local beneficiation. However, given the current price of hides on the international market, this has effectively amounted to a ban on exports. Under-investment in local tanneries has caused the low uptake of hides by tanneries, leading to stock build-up and spoilage at abattoirs. The Ministry of Local Government, Public Works and National Housing has, though a model by-law, encouraged rural district councils (RDCs) to charge a levy of 10.5% on all live cattle sales. This includes cattle traded between farmers for herd building as well as those for slaughter[26]. The Agricultural Marketing Authority (AMA) Statutory Instrument (SI) 147 of 2012 has led to increases in the cost of these raw materials in the stockfeed sector. Value added tax (VAT) of 15% charged on molasses used in cattle feeds is inconsistent with SI 273 of 2003 which zero rates by-products used for feed production. The current policy of the Grain Marketing Board (GMB) of buying maize at prices that exceed import parity has led to side-marketing by contracted maize farmers to the GMB and thereby discouraging contract farming relationships. Further, GMB's policy of reselling maize at lower prices to its feed and milling divisions is an unfair trade practice that impacts upon private millers and stockfeed plants."

[26] We got mixed reports on whether taxes applied for inter-farmer exchange. In Chiredze the Team was told that there was not tax on these transactions.

Element of cost	Farm type			Notes and relevant legislation
	Commercial	Partially communal	Communal	
	$/animal sold			
Farm to abattoir				
Fixed costs				
Land unit tax	18	13	13	Ranges from $1-2/ha/year depending on Natural Region. Collection variable/sporadic. Rural District Councils Act
Environmental Management Agency	5	5	-	Environmental Management Acts
Farmers Union	4	1	1	All farmers who sell cattle have to be in an association. Farmers Licensing and Levy Act
Zimbabwe National Water Authority	1	1	-	Environmental Management Acts
Sub-total fixed costs	28	20	14	
Variable costs				
Rural Development Council Levy	75	68	68	Various levies being used. Regulation unclear.
Grading and inspection	4	4	4	Agricultural Products Marketing Regulation
Movement permits (actual cost)	1	5	5	Animal Health and Stock theft regulations (various)
Movement permit (time and transport costs)	3	18	18	Includes time and costs of obtaining permits
Sub-total	83	95	95	
Total Farm to abattoir costs	111	115	109	

TABLE 18: ESTIMATES OF REGULATORY COSTS
Source: Adapted from Chamboko and Erasmus (2014) plus interviews

We draw a number of conclusions from this analysis. Firstly, we have excluded the regulatory costs identified and that are specific to processing and distribution as Chamboko and Erasmus found these to be inconsequential (e.g., just over Z$1/animal). Secondly, broadly speaking, levies and taxes seem to fall fairly equally between different scales and types of production. This suggests that many of these levies are designed to be sources of income rather than active policy instruments aimed at promoting national developmental strategies. Thirdly, by far the highest proportion of these levies falls to Rural Development Council (RDC) 'taxes and levies' of various different kinds. Many of these, according to interviews, seem to be levies focuses on easily identifiable points of rural economic activity (e.g., auctions, police halts, veterinary halts) where collection of cash is relatively simple. A

final element highlighted by Chamboko and Erasmus is the high transaction cost associated with regulatory compliance. This is particularly noticeable and egregious for farmers with lower off-sales who have to spend a lot of time travelling to points where permits are issues and waiting for their issuance.

Cattle marketing is a clear and obvious rural economic activity in Zimbabwe. In a country where the economy has been struggling for some years, it is not surprising that many economic actors have migrated towards this source of value as a means of income. In addition, the number and scale of formal compliance requirements in beef cattle marketing may have driven informal marketing channels with lower compliance costs. Numerous interviews conducted by the Team supported this proposition.

Crudely speaking, Table 18 shows that commercial farmers save money on movement of animals because they can do so at scale, whereas partially commercial farmers who have fewer animals entering the market spend proportionately more on compliance and informal marketing costs. How widespread the impact of compliance costs are on purely communal farmers are either not entering the formal market or by-passing it is hard to say.

Most actors interviewed mentioned formal and informal compliance costs and levies. When asked how these were subsumed into the cost of doing business it was universally agreed that these in-chain costs are passed on to producers in the form of depressed farm/auction/abattoir gate prices.

2.3.4 Farming systems

Different animal farming systems can be associated to the different types of farm that we consider in this study (communal, partially communal/commercial, and fully commercial). The functioning of livestock activities in these farms has already been presented in the previous sections (see in particular the section “producers”).

Each type has a different set of advantages and challenges to face in order to develop cattle activities and to increase its participation to the beef value chain.

For communal farms, cattle production is limited by access to grazing areas, and control of diseases (mainly tick born disease). Developing cattle husbandry as a commercial activity is limited by the numerous functions assumed by cattle and the lack of alternative to assume these functions. Animals are sold when there are domestic needs, not in relation with profitability. There are sold locally mainly to other farmers (and then they escape to many fees) or to local butchers. These butchers are considered as members of the local community and transactions with them is said to be easier and fairer (our interview).

Keeping cattle has been a major factor of farm resilience in the past period of hyper-inflation or in the current period of lack of cash. This shows the rationality of this livestock farming system in the present context.

Partially communal/ partially commercial farms have access to more grazing areas (in particular A1 farms) but have a limited access to services and technical supports. They can produce higher quality animals but main constraints are related to limited access to cash and to credit, and difficulties in

marketing their animals. A same animal can be sold from Z$300 to Z$500 according to the marketing channel (our interview). Transport costs are high and abattoirs only take in charge the collect of cattle when there are at least 15 of them. Farmers' relations with abattoirs are strained in relation with the grading system and the non-payment of the 5th quarter. Higher prices can be obtained at public auctions, since many buyers are competing for cattle. But as public auctions are declining (following the strategy of many abattoirs to purchase cattle by the intermediary of an agent-collector), farmers are much dependent on middlemen.

We can consider here fully commercial farms as livestock farms which have had to adapt to the land reform. Two strategies have been identified during our study (their presentation only serve here as examples and does not pretend to cover the diversity of the situations). The first strategy is illustrated by farmers who have been seized their lands but have kept their herd. Access to grazing area is then a major constraint (in relation with the herd size) and can be resolved by renting pastures. This is often achieved through informal and insecure arrangements (one of the white farmers that we met, had arrangements with the 23 new owners of what was his farm in the past). As long as land renting is informal, investment will be limited. A second strategy have been identified among farmers who have seen part of their farm seized: they have shifted to activities which do not require large area of land such as investing in a rural abattoir and selling slaughtering services.

The functioning of the livestock farming systems in the two last types (partially communal/commercial and fully commercial) is little known and should deserve deeper analysis.

2.4 Vertical integration in the Zimbabwe beef value chain

The formal beef value chain in Zimbabwe has elements of vertical integration. The main areas/functions where integration occurs are in the axis:

trader/middleman ➔ abattoir ➔ meat processor ➔ wholesaler

With beef off-take switching from commercial farmers to partially commercial/communal and fully communal farmer categories, actors in the processing sectors have had to move down their value chains in an attempt to maintain throughput. Abattoirs have either developed buying strategies (including using buying agents) or have switched to toll slaughter where no ownership is taken of the animals or the meat. Some meat processing companies have incorporated abattoirs to guarantee throughput, whilst other have divested or moth-balled their abattoirs to limit risk. Many urban abattoirs and meat processors have opened allied businesses in meat wholesaling, catering and retailing including factory off-sales.

Within the formal animal and meat industries Zimbabwe is well served by business associations that represent specialist sectors (see Table 19 below). Informal business are not associated (e.g., informal butchers and informal retail).

Abattoirs are very active in vertical integration. Examples are given by abattoirs investing in:

- animal collection (through employing their own agents or by organizing buying stations where farmers gather the animals for sell, e.g. Sabie Meats in Chiredzi);

- extension services: advices, vaccination, animal tagging, possibly providing stock feed at credit, even improved breed (e.g. Sabie Meats)
- contract feeding schemes: One abattoir, Kaola Park, is experiencing the following system: Farmers can send to this abattoir a batch of 15 animals. The abattoir keep them in their own feed lot during 90 days and charge the owner/farmer, Z$3.52/ day/ animal (Z$317 per head).
- beef production: many abattoirs have their own feed lots (e.g Binder, Kaola Park, Sabie Meat) and in some instances farms for back-grounding cattle or breeding (Koala Park, MC Meats and Surrey Abattoir).

Animal collection and feed lotting are the main strategies developed by the abattoirs. The others (extension services and contract feeding) are more like experiments, but they show how securing their supply is a major challenge for the abattoirs.

2.5 Horizontal integration in the Zimbabwe beef value chain

The Government of Zimbabwe has a long history of supporting cooperatives as a means of empowering workers and producers, and this is recognized by a separate Ministerial portfolio for Small and Medium Enterprises and Cooperative Development. In 2016 there were 194 farming cooperatives and 92 Savings and Credit Associations registered (Nyoni, 2016). Current active membership of these bodies is not reported.

Across Zimbabwe there are numerous farmer groups and groupings associated with different NGO interventions. In relation with cattle and beef, we can mention as an example the pen fattening groups (e. g. groups constituted in the framework of the project "USAID Feed the Future Zimbabwe Livestock Development Project"). These groups permit farmers' access to credit (co-liability for loans and since the NGO assumes the technical assistance and guarantees the technical feasibility of the project to the microfinance institution) and the NGO presence contributes to improve the bargaining power of the farmers when it comes to trade the animals. These issues are considered in greater depth in the Social Analysis below.

Function	Actor	Association	Notes/websites
Inputs	Animal Health Workers	Zimbabwe Veterinary Association	
	Breeders	Zimbabwe Herd Book with associated Breeders Associations	Tuli, Brahman, Mashona
	Agrodealers	None	
	Feed Manufacturers	Stockfeed Manufacturers Association	
Production	Communal farmers	Zimbabwe Farmers Union, ZFU	http://www.zfu.org.zw/
	Partially communal/commercial farmers	Zimbabwe National Farmers Union, ZNFU	
	Commercial farmers	Zimbabwe Commercial Farmers Union, ZCFU ("indigenous" commercial farmers)	http://zcfu.org.zw/
		Commercial Farmers Union of Zimbabwe, CFU (mainly white farmers)	http://www.cfuzim.org/
	Farm workers	General Agriculture and Plantation Workers Union of Zimbabwe (GAPWUZ)	
		Horticulture and General Agricultural and Plantation Workers' Union of Zimbabwe (HGAPWUZ)	
		Progressive Agriculture and Allied Industries Workers Union of Zimbabwe (PAAWUZ)	
Intermediaries	Traders/middlemen	None	
	Auctions	None	Members of the Livestock and Meat Advisory Council
Processing	Abattoirs	Zimbabwe Association of Private Abattoirs	
	Meat processors	Meat Processors Association of Zimbabwe	
Wholesale	Wholesalers	None	
Retail	Rural butchers	None	
	Shops	Zimbabwe Association of Butchers	

	Catering		
	Informal retailers	None	
Consumers		Consumer Council of Zimbabwe	http://www.ccz.org.zw

TABLE 19: BEEF SECTORS BODIES AND ASSOCIATIONS (HORIZONTAL INTEGRATION)
Source: various websites

2.6 Governance of the beef value chain

In the past (pre-2002), the beef value chain in Zimbabwe was dominated by few large scale farmers and one State owned company, the Cold Storage Company (CSC). These few actors have been replaced by a multitude of smallholders, coordinated by informal arrangements. A new governance has emerged with a new share of power, risks and value added. The abattoirs are the new key players of this value chain. They are well structured horizontally, in the Zimbabwe Abattoirs Association. They have integrated vertically within the value chain, investing in animal collection, feed lots, feed processing, and outgrower schemes demonstrating innovation and flexibility in the face of challenging economic conditions.

Abattoirs are engaged in some degree of tension and/or conflict with different stakeholders in the value chain due to their pivotal role, and have been able to impose some rules although these are considered as unfair by some stakeholders. Examples include: none payment of some fees to RDC and the belief that abattoirs underpay cattle owners for the 5th quarter. As we have seen, the current beef grading system is also considered unfair.

In term of sanitary and economic risks, abattoirs benefit *de facto* in the 'red zone' from a kind of "quarantine area" status that allows them to keep trading their own cattle in case of diseases outbreak, and they do not pay their workers when any events slow down slaughtering activity. Abattoirs try to develop contract relationships with small scale farmers in order to secure cattle supply. These arrangements are still experimental at the moment, they do not rely on formal contracts, and mutual suspicion dominates.

The beef value chain was dominated in the past by State intervention, partly based on its veterinary services managing market access. The alliance with the export sector led to a strong focus on the control of the foot-and-mouth disease. This control was based on a strategy of exclusion of a non-FMD free zone, through fences (rather than on a more inclusive strategy of vaccination). The 'command livestock programme' intends to restore this strategy and to develop a cattle identification system (see above). This programme is State driven. The effectiveness of such programme will show the State capacity to restore its role as a key player of the beef value chain, as well as its political will to turn it as a mean for economic inclusiveness or not.

2.7 Conclusion of the functional analysis

Whilst the previous structure of the beef value chain in Zimbabwe was clearly highly beneficial to formal/commercial farmers, the evidence shows that the new structure is more inclusive but in many regards dysfunctional in that the full value of animals and their products is not fulfilled. Two aspects are key to this: that current domestic demand for beef is not fulfilled, and that Zimbabwe is not using its potentially highly lucrative market access for beef and beef products.

The key change in recent times has been a decline in purely commercial beef production and an increase in the number of farmers producing small number of animals under communal farming regimes with the aim of risk avoidance and/or capital accumulation/saving.

The main technical and organisation dysfunctions identified are:

- **Undervaluation of animal benefits**

Successive policies and plans have under-estimated the contribution that animals make to the Zimbabwean society and economy. From the perspective of communal farmers, the role that cattle have in draft power, manuring and savings is seldom considered or balanced against the possible benefits of market access. With respect to commercial and partially commercial farmers, opportunities for high value export sales are currently withheld due to market access restrictions and this represents a potential loss to the economy as a whole. These two poles of value need to be reconciled.

- **Carcass Grading – animal type/size/quality issues**

Animal composition has changed in Zimbabwe with higher proportions of indigenous breeds and smaller, leaner animals. The traditional grading structure at the point of slaughter was designed to promote exotic, large, high quality animals producing meat for high value export markets. Keeping the old system under-values animals from partially commercial/communal and communal farmers unnecessarily and should be reformed to reflect the changes that have occurred to the national herd.

- **Fifth quarter**

The value of offal etc. is effectively captured within the beef value chain at the point of slaughter. However, as a source of food, particularly in rural areas, it remains very important (although largely unmeasured). Pricing structures that recognise the value of the fifth quarter as a source of food for the majority of Zimbabweans could have substantial nutrition benefits.

- **Traceability identification systems**

Currently, the traceability of animals from partially commercial/communal and communal farmers is insufficient to meet the OIE requirements for international trade, and is also inadequate for the good operation of national trade. Hence stock-theft is rife and illegal animal movement leading to outbreaks of transboundary disease.

- Information systems (prices)

An important element of a functional market is price transparency. It is argued by some that this is poor in Zimbabwe, but, given that farmers have a choice between traders, abattoir and auction sales, we would say that price discovery and options are, relatively speaking, not so bad. However,

much could be done to improve farmer knowledge and access to market choice through and application of new marketing tools such as ICTs.

- **Cash access/ trust in bank**

At the time of this research a high premium on cash was observed, particularly between rural traders/middlemen and communal farmers. This cash premium is having a number of perverse effects on the beef economy. It is promoting herd growth for some groups where savings are considered highly risky in banks. It is leading to growth in the informal trading (and in some cases illegal trading) sectors where premiums for cash or non-cash sales are encourage animal movements. It is clearly increasing transaction costs across the sector.

- **Insecurity (policies, market..)**

Economic uncertainty expresses itself in the beef economy by retention of animals and herd growth as a means of secure savings and a hedge against future economic change (e.g., hyper-inflation). Whilst this is rational on the part of individuals, is reduces the contribution of beef to the economy by driving production away from it optimal levels.

- **Informal 'taxation and levies' – transaction costs**

The absence of cash and shortage of Government funds in Zimbabwe has promoted a plethora of formal (e.g., local government levies) and informal (e.g., police halts) 'taxes' on the beef sector. These high transaction costs fall highest on those that move/sell small number of animals as the unit cost per animal tends to be higher.

- **Disease management**

Disease management has largely broken down in Zimbabwe. Illegal movement of animals seeking high value markets in cities and between farmers allied to high informal transaction costs, plus inadequate veterinary control and lack of traceability means that the Government of Zimbabwe is fighting a losing battle against outbreaks of transboundary animal diseases, particularly FMD.

- **Drought management**

Zimbabwe suffers from periodic droughts (e.g., 1982-84, 1991-92, 2015-16). Policies and economic/political circumstances have changed, but the impact of these droughts clearly still fall more heavily on communal farmers than other categories. Scoones (2018:167) offers four lessons from his long-term study: a) veterinary controls to movement increases mortality and more flexible arrangements would help; b) access to water is more important than access to grazing to preserve stock; c) supplementary feed is vital for survival; and, d) de-stocking should be encouraged even though it is unlikely due to the high latent value of animals for draftpower.

3. ECONOMIC ANALYSIS

3.1 Introduction and background

The economic analysis of the Zimbabwe beef value chain addresses the questions: what is the contribution of this value chain to economic growth; and, is this economic growth inclusive? The analysis is necessarily partial as discussed above under method. The aim is to provide information on orders of magnitude that will guide and inform. This section considers the financial analysis (e.g., cost and benefits per actor identified in the functional analysis), the economic contribution (e.g., contribution to sectoral, national, public and trade accounts), the competitiveness of the value chain, and its distributive efficiency (e.g., income, employment and profits).

3.1.1 Methodology

The economic analysis has been constructed from four main methods:

- Identification of the main economic actors using secondary data and key informant interviews.
- Development of typical farm models for the farmer categories identified in the functional analysis using interviews (See Annexes 4 and 5).
- Construction of typical actor operating accounts using interviews.
- Assessment of prices, numbers of actors and volumes using data from secondary sources.

The results are a combination of best-guess and, where possible triangulation through interview and consulting secondary data.

3.1.2 Building the AgriFood chain Analysis (AFA) model

Using the actors, agents, prices and volumes identified in the functional analysis, a Zimbabwe Beef Value Chain Economic Model has been developed using the AFA modelling approach. Once the model was created (see Figure 20 and Table 20 below), analysis of the financial and economic implications is possible.

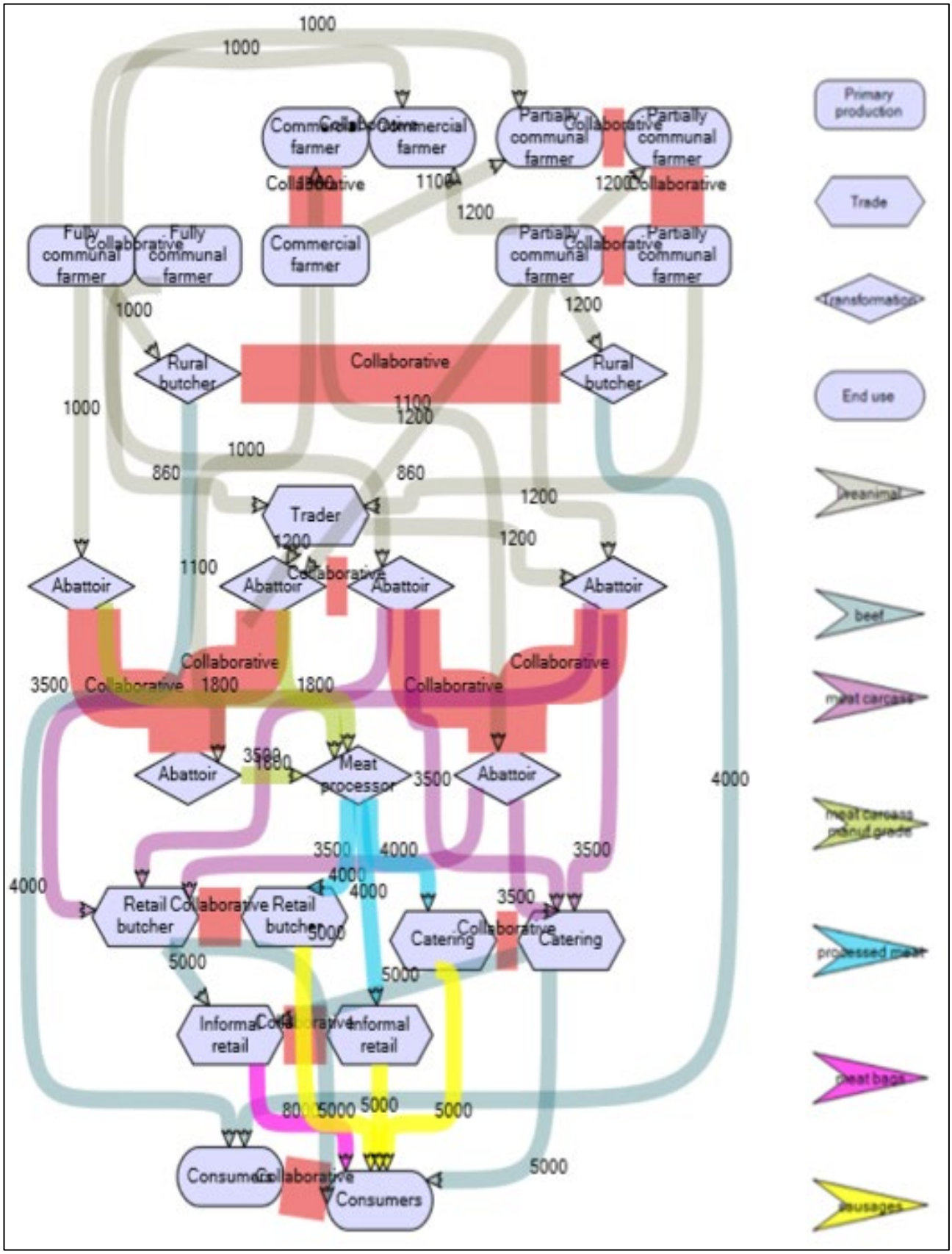


FIGURE 20: THE ZIMBABWE BEEF VALUE CHAIN AFA 'PRINT-OUT' (Z$/MT)
Source: Interviews and AFA

A value chain includes agents that perform operations corresponding to different functions within the chain. There are four types of functions: primary production, trade, transformation, end use. Each operation is described and characterized through a budget that gathers all the costs and incomes associated with the operation. One agent can perform more than one operation corresponding to different functions (primary production and trade for instance) or to different input/output prices.

Agent	Operation	Classification	Description	Comments
Fully communal farmer	PFC	Primary production	Sales of live animal	Price: 1000/T (350 for 1 animal of 350kg)
	PFCTR[27]	Primary production	Sales of live animal to trader	Price: 860/T
	USCFC	End use	Self-consumption	Price: 1000/T (assumption)
Partially communal farmer	PPCTR	Primary production	Sales of live animal to trader	Price: 860/T (430 for 1 animal of 375kg)
	PPCOT	Primary production	Sales of live animal to all others	Price: 1200/T (450 for 1 animal of 375kg)
	USCPC	End use	Self-consumption	Price: 1200/T (assumption)
	PCA	End use[28]	Live animals bought from other farmers	Price: 1000/T and 1100/T
Commercial farmer	PCOM	Primary production	Sales of live animal	Price: 1100/T (495 for 1 animal of 450kg)
	USCCO	End use	Self-consumption	Price: 1100/T (assumption)
	COMA	End use	Live animals bought from other farmers	Price: 1000/T and 1200/T
Rural butcher	TFCRB	Transformation	Transformation of purchases from fully communal	
	TPCRB	Transformation	Transformation of purchases from partially communal	
Trader	CFCS	Trade	Sales of animals	
Abattoir	TCPCT	Transformation	Transformation of purchases from partially communal and trader	
	TCom	Transformation	Transformation of purchases from commercial	
	TCFC	Transformation	Transformation of purchases from fully communal	
	TPCM	Transformation	Transformation of purchases from partially communal and trader into manuf grade	

[27] Nb: PFCTR and PPCTR sell at Z$850/Mt but appear as Z$1000/Mt in Figure 17 above. This is caused by the extreme complexity of the value chain 'crowding out' the individual figures when the flow is generated by the AFA software. We hope that this problem will be address in future AFA versions.

[28] PCA and COMA are sales from one farmer to another (see Figure 1 above). This is essentially a feedback look in the model and the Team found it impossible to generate a suitable solution to this with the current version of AFA. Therefore these flows were assumed to be an "end use".

Agent	Operation	Classification	Description	Comments
	TCMM	Transformation	Transformation of purchases from commercial into manuf grade	
	TFCM	Transformation	Transformation of purchases from fully communal into manuf grade	
Meat processor	TPM	Transformation	Transformation of manuf grade carcass into processed meat	
Retail butcher	CPM	Trade	Sales of sausages made by Meat Processor	Assume sale price=5,500/T. Assume accounts for 15% of total costs
	CM	Trade	Sales of beef	
Informal retail	CMI	Trade	Sales of meat bags	
	CPMI	Trade	Sales of sausages	price=5,500/T. Assume accounts for 15% of total costs
Catering	CSMCat	Trade	Sales of beef	
	CSPMCat	Trade	Sales of sausages	price=5,500/T. Assume accounts for 15% of total costs
Meat consumers	UCM	End use	Consumption of beef, meat bags and sausages	
	UCMR	End use	Rural consumption of beef	

TABLE 20: ACRONYMS FOR ACTORS AND OPERATIONS IN THE CONSOLIDATED OPERATION ACCOUNT

Source: Zimbabwe Beef Value Chain AgriFood chain Analysis

Note: A Table of flow proportions can be found at Annex 6

3.2 Considerations in the national economy

3.2.1 Taxes, subsidies, depreciation, interest and the value of foreign exchange.

The macro-economic situation in Zimbabwe is somewhat complex and needs to be seen in the light of a bifurcated economy based on formal sector and informal economies working in parallel. In simple terms, trade in the communal and partially communal areas is informal, only entering the formal realm when a transaction with an abattoir occurs. However, an unknown volume of cattle do not enter this formal realm at all, and this is the centre of some debate. In the formal realm, businesses along the value chain pay taxes and comply with rules and regulations. However, the situation is clouded by many years of actors in the beef value chain having developed strategies to survive economic factors that are out of their control, including: the expectation of inflation, the possibility of cash shortages (both foreign exchange and Zimbabwe dollars), the need to live with a range of domestic rent seeking activities and the possible intervention by Government in different aspects of agriculture (e.g., subsidy). We discuss these issues and their impact here.

3.2.2 Inflation and the domestic cost of money (interest)

Consumer prices in Zimbabwe increased 3% year on year as of February 2018. It should be noted that there has been a good deal of variation in inflation in Zimbabwe in the past 10 years, with a range of rates from 4% to minus 3%. In the longer term, food inflation was lower that non-food inflation, but this has switched since early 2017 (see Figure 21), partly, it is argued, because with a good raining season, farmers are restocking livestock and this reduces supply.

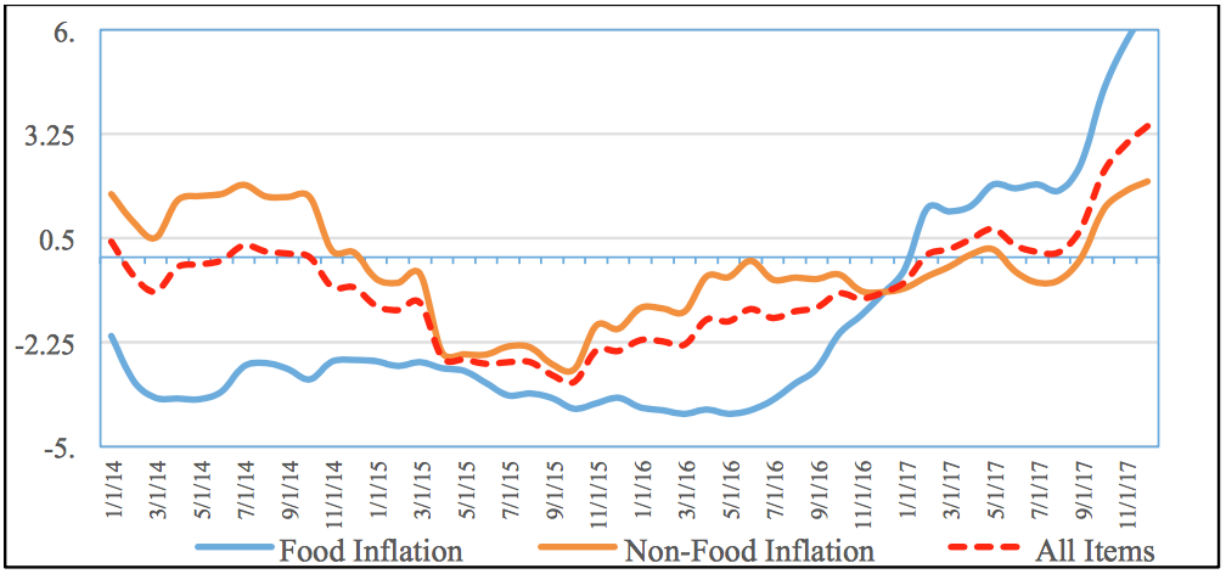


FIGURE 21: LONG TERM FOOD AND NON FOOD INFLATION
Source: Zimstat 2018 quoted in Reserve Bank of Zimbabwe (2018)

Zimbabwe has no official discount rate, but uses a Weighted Lending Rate which was 9.39% at the time of this research. The official lending rate was capped by government at 12% in March 2017 and this intervention may have limited the amount of lending available.

3.2.3 The value of foreign exchange and cash

The official exchange rate in Zimbabwe from Zimbabwe dollars to United States dollars in 1:1. However, the Team found on the ground that the situation is a) much more complex that this; and, b) fluid. Table 21 summarises the types and values of different forms of money and their relative exchange rates at the time of the fieldwork.

Currency	Money type	Official Value (Z$)	Actual Value (Z$)	Notes
US$	Cash	1	1.50	Values may vary with the condition of note, denomination and amount exchanged
US$	Emoney	1	1.43 – 1.46	
Z$	Cash	1	1.20	
Z$	Bonds	1	1.25 – 1.29	
Z$	Emoney	1	0.8	

TABLE 21: OFFICIAL AND ACTUAL VALUES OF CURRENCY AND CASH
Source: Interviews

3.2.4 Rent seeking and the cost of doing business

We discuss the issue of levies, regulation, compliance and the cost of doing business above (Table 18). Clearly there is an element of unrecorded and unmeasured cost and we found much talk of rent seeking activities, particularly with regard to animal movement. These types of costs fall asymmetrically. These informal costs are a higher proportion of costs for small scale farmers wishing to enter trade that for larger farmers/actors with a greater turn-over and scale among with to share the burden.

3.2.5 Government interventions

There have been, in recent years, very limited availability of funds to subsidise agriculture in Zimbabwe. Notwithstanding, this changed in 2017 with the implementation of the Command Agriculture Programme in the maize sector. This programme guaranteed purchases of all maize at Z$390/mt at a time when the border parity price of maize was nearer to Z$250. The next effect was a bumper harvest, which was accentuated by an excellent rainfall year.

How much did this policy/subsidy impact upon the beef sector? Since few farmers use purchased feeds in this sector the inflated price of domestic maize probably did not have a major impact. It is possible that the exceptional profits available to farmers from maize production has been a factor in retaining animal for draft power in the hope that larger land areas could be planted to benefit from future subsidy programmes.

3.2.6 Taxes and duties

Zimbabwe has zero rated taxes and duties on agricultural imports (see http://www.zimra.co.zw/). The domestic VAT rates on all goods and services is 15%. Income tax is progressive and starts at US$300/month with a higher rate of 50% over $20,000/month.

3.3 Financial analysis: viability for every type of actors

This section consider the business motives of the various actors identified in the functional analysis. Here we consider the cost benefits according to the perspective of each actor based on actual flows

(e.g., sales) to create an operating account, removing actors from the value chain that are not engaged in exchange (e.g., auctioneers and transporters). Note that this analysis excludes family labour, the return to which is considered elsewhere.

The issue of own consumption for the beef value chain is a testing one. We found evidence of own consumption among all producers, but it was strongly emphasised by all actors that this is very limited and in some cases where home-slaughter occurs, not legal. For Commercial farmers, the proportion of home slaughter is small compared with herd size, and therefore not important. For Communal farmers, own consumption seems to be very rare and only larger herd owners can afford ritual slaughter or gift. The proportion and importance of gift/own consumption of animals is a more important proportion for Partially Communal/Commercial farmers who have relatively small herds but largely communal farming practices. We concluded that we would assume a zero level of gift/own consumption for Communal farmers, but retain this for the Commercial and Communal/Commercial options.

In any modelling exercise difficult choices have to be made to prevent the analysis being over-complex. In this case some actors groups have been conflated. In the functional analysis the diversity of abattoirs is explained, but in developing the model we used data from key stakeholder interviews to create a 'typical' abattoir (see Annex 6). The functions where this is most noticable are: abattoirs, processors, wholesalers and retailers.

We consider here the relative viability of the various actors in the value chain divided into three categories: production, transformation and trade.

Production

All three types of farms currently operate at a profit. This ranges from US$103 per annum for a Communal farm, through US$2,150 for a Partially Commercial/Communal farm to US$29,052 for a Commercial farm. Fully Communal and Partially Commercial/Communal farms have profit margins of 60% and 50% respectively, while Commercial farms achieve a profit margin of 30%.

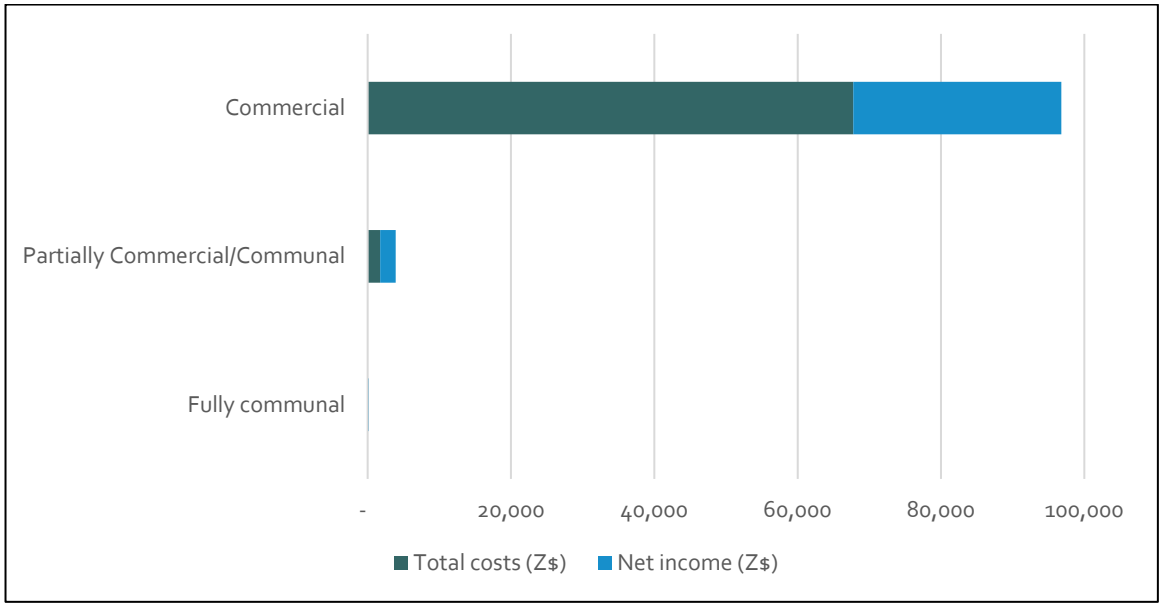


FIGURE 22: PROFITABILITY BY PRODUCER TYPE
Source: Interviews and AFA analysis

Figure 22 shows the relative viability for the three different farm models described above in the functional analysis. The contrast is shown here between large scale commercial production with its relatively high costs and returns, and the extremely low total cost and return characteristics of the majority, communal farming model. This structure reflects the widely different objectives of these production models. Commercial farming is for profit or for savings through herd-growth. Communal farming has a wide range of none commercial uses, including risk management, draft power, manure, milk and social status.

Partially Commercial/Communal farmers are interesting as a group. They have low total costs as they mostly operate an open 'communal' farming system but produce surplus which they trade into the wider economy, and hence generate net income.

The cost structure of the beef farming systems is shown in Figure 23 below. This shows that both Communal and Partially Communal/Commercial models use very few purchased inputs with the limited exception of consumables (largely veterinary drugs and dipping costs). Costs are higher for Commercial agriculture with salaries playing a role.

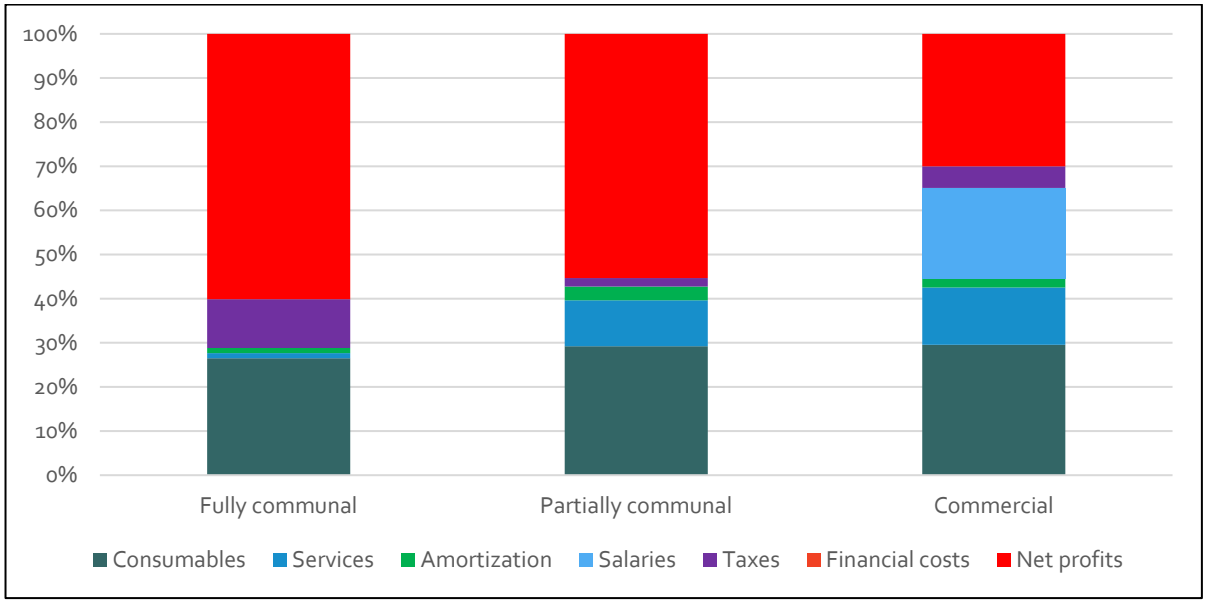


FIGURE 23: FARM PRODUCTION COST DISAGGREGATION
Source: Interviews and AFA analysis

Transformation

The primary beef transformation actors are abattoirs and meat processors (see Figure 24). The recent growth in abattoir numbers (particularly smaller abattoirs) is reflected in the strong profit results.

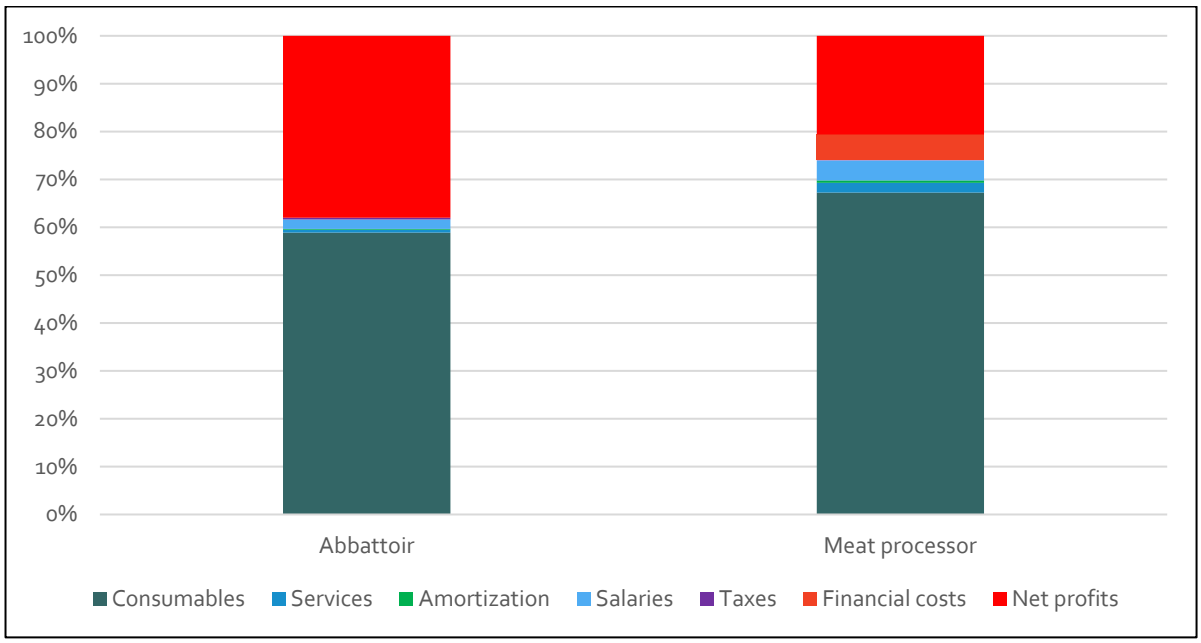


FIGURE 24: TRANSFORMATION COST DISAGGREGATION
Source: Interviews and AFA analysis

The meat processing model developed from interviews suggested that this level of actor has adjusted well to the current economic climate in Zimbabwe, making good net profits despite the relatively high cost of certain inputs such as casings (our model showed net profits of US$22,000 per month on net sales of US$100,000 per month).

Trade

We identified five key actors in trade: middlemen, rural butchers, retail butchers, caterers and informal retailers (Nb: although an important actor in the Zimbabwe beef value chain, auctioneers have not been included in this analysis because almost no transformation occurs or value is added/deducted to the economy – only exchange).

The results (Figure 25) show that, at the time of the field research, middlemen were making somewhat 'thin' profits. As we have discussed above, this may be survey error since real prices for sales from farmers to middlemen were hard to ascertain. All other actors in the trade area are profitable, although retail butchers and caterers are less so than rural butchers and informal retailers. Our models showed net profits on sales as follows: middleman - US$5,100 on US$37,916; rural butcher - US$533 on US$3,322; retail butcher - US$1,348 on US$9,408; caterer - US$746 on US$6,600; and, informal retailer - US$257 on US$704. This reflects the higher throughput and cost structure of some actors (e.g., retail butchers and caterers) and the low throughputs and low cost structure of other (e.g., rural butchers and informal retailers.

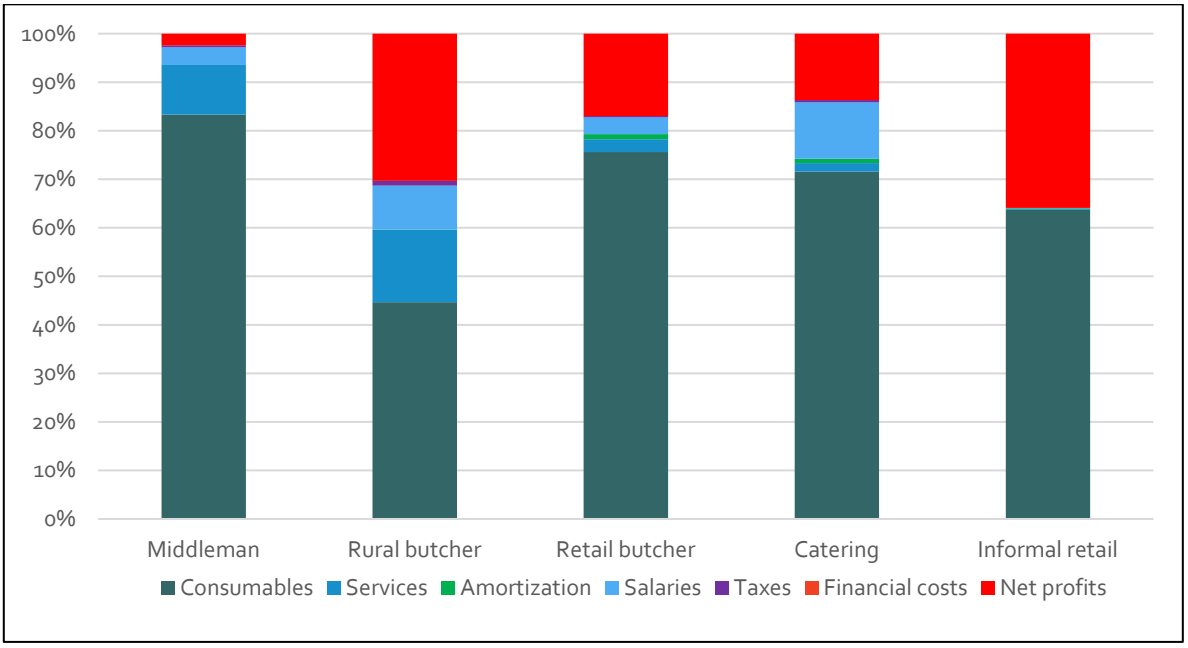


FIGURE 25: TRADE COST DISAGGREGATION
Source: Interviews and AFA analysis

3.4 Consolidation of Value Chain Accounts

The initial production volumes estimated from the AFA model are shown in Table 22. The greatest volume is from sale of Communal animals, but there is a significant quantity from Partially Communal/Commercial farmers to other actors including others farmers and directly to abattoirs.
The initial production volumes estimated from the AFA model are shown in Table 22. The greatest volume is from sale of Partially Communal/Commercial farmers, but there is a significant quantity from Communal farmers to other actors including other farmers.

Production unit	Type of transaction	Beef (Mt)*	Percentage (%)
Fully Communal	Live animal sold to trader	7,400	3
Fully Communal	Live animal sold to all others	67,000	30
Partially Commercial/Communal	Live animal sold to trader	19,200	9
Partially Commercial/Communal	Live animal sold to all others	76,600	33
Commercial	Live animal sold	55,600	25
Total		225,800	100

TABLE 22: INITIAL VOLUMES ENTERING THE VALUE CHAIN
Source: Interviews and AFA analysis

* Beef volume assumes typical animal live weight = 450kg per Commercial, 375kg per Partially Commercial/Communal and 350kg per Communal

The aggregated accounts (see Table 23 and Figure 26) show that abattoirs account for the highest proportion of total net income in the VC (32%), followed by partially communal and fully communal farms (19% and 14% of total net income of all actors, respectively), retail butchers (11%), rural butchers (7%), informal retail (7%), commercial farms (6%), catering (5%), traders (0.24%) and meat processors (0.03%).

Actor	Net income (US$)
Fully communal farmers	43,846,333
Partially communal farmers	59,992,902
Commercial farmers	18,355,710
Abattoirs	102,538,044
Meat processors	83,310
Middlemen	759,577
Rural butchers	21,001,298
Retail butchers	34,128,422
Caterers	14,492,768
Informal retailers	21,041,926

TABLE 23: AGGREGATE INCOME ACCOUNTS BY ACTOR
Source: Interviews and AFA analysis

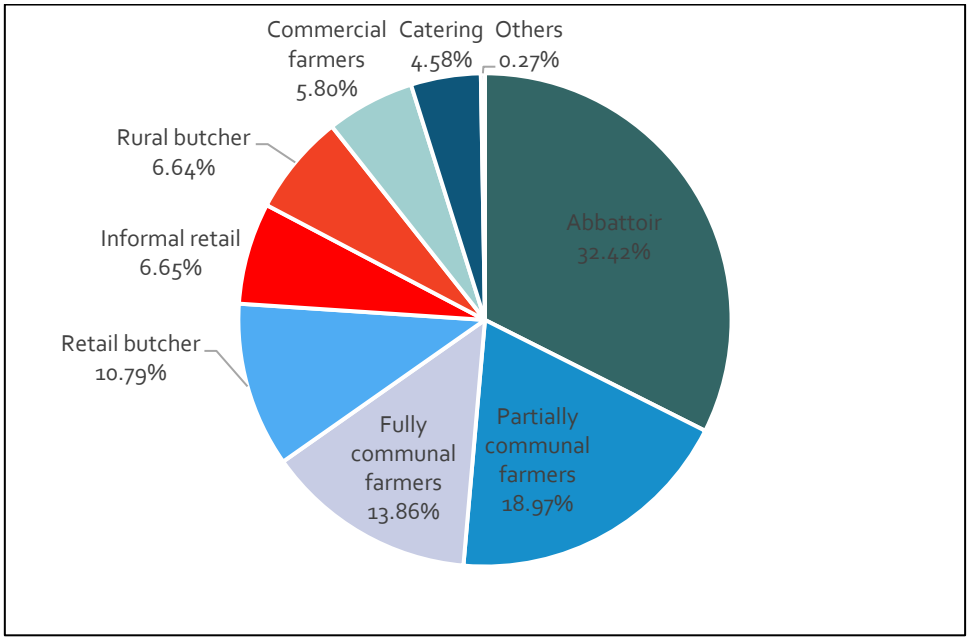


FIGURE 26: AGGREGATE NET INCOME BY ACTOR
Source: Interviews and AFA analysis

Figure 26 shows the net income of each of the group of actors used in the operational model. Caterers, retail butchers and abattoirs are the largest contributors to the value chain with abattoirs selling the most out of the chain. This figure particularly reflects the importance of the 5th quarter rather than other value chain by products. Strong income is shown in the abattoir and catering sectors, but also in the Partially Commercial/Communal sector.

Actors	Total product sold in the VC	Total product off VC*	Total costs	Net income
Fully communal farmers	66,865,000	6,499,001	29,517,668	43,846,333
Partially communal/commercial farmers	72,583,200	35,848,800	48,439,098	59,992,902
Commercial farmers	53,820,800	7,339,200	42,804,290	18,355,710
Abattoirs	218,170,620	51,631,975	167,264,550	102,538,044
Meat processors	404,083	-	320,773	83,310
Middlemen	31,920,000	-	31,160,423	759,577
Rural butchers	-	69,268,700	48,267,402	21,001,298
Retail butchers	24,121,840	176,994,521	166,987,939	34,128,422
Caterers	12,690,800	931,668,401	91,364,873	14,492,768
Informal retails	-	58,614,282	37,572,357	21,041,926
Total		499,363,320	663,699,373	316,240,290

TABLE 24: SUMMARY OF ACTOR VIABILITY
Source: Interviews and AFA analysis

* This category is a distinction made by the AFA model. It refers to all production that is NOT sold to other actors

3.5 Effects on the national economy

In order to understand the effects of the various actors and functions within the beef value chain we have established a consolidated operating accounts (see Tables Table 27 and Table 28 in annexes). This collates all value added by direct actors and includes intermediate consumption by those supplied by the beef value chain. Intermediate consumption for the Zimbabwe beef value chain is US$113,353,805.

Contribution of beef value chain		Unit	Value	Source
Gross Domestic Product	Total VC production	US$	499,363,320	
	Total value added*	US$	427,303,401	
	GDP	US$	16,289,000,000	World Bank, 2016. World Integrated Trade Solution (WITS).
	Value added share of GDP	**%**	2.6	
	Rate of integration into the economy	**%**	85.6	
	Total value added	US$	427,303,401	
	Agricultural GDP	US$	1,600,000,000	USDA 2015. Zimbabwe Agricultural Economic Fact Sheet, GAIN reports.
	Value added share of Ag GDP	%	26.7	
Public finances	Taxes	US$	21,511,203	
	Government earnings	US$	4,000,000,000	International Monetary Fund, 2016. General Government Revenue for Zimbabwe.
	Contribution to public funds balance	%	0.5	
Balance of trade	Total beef value chain production	US$	499,363,320	
	Total beef value chain imports	US$	72,059,919	
	Balance of trade	US$	2,380,000,000	USDA 2015. Zimbabwe Agricultural Economic Fact Sheet
	VC imports/Balance of trade	%	3.0	
	VC imports/VC production	%	14.4	

TABLE 25: SUMMARY OF BEEF VALUE CHAIN CONTRIBUTIONS TO THE NATIONAL ECONOMY
Sources: A table of macro-economic data source information is at Annex 7
** Nb: Total VA = Direct VA of the VC actors + Indirect VA of suppliers (external to the VC).*

Total value added is estimated at US$427 million in 2017. This allows calculation of the contribution of VC to GDP and the contribution of VC to Agricultural GDP (Value Added share of the Agriculture sector GDP, direct and indirect)

The value chain is well integrated into the domestic economy as demonstrated by a rate of integration (total value added divided by the total production) of 86%. That means that for each ton of beef produced, 86% is value added and 14% is imports. The beef VC provides a major contribution (about 27%) to the agricultural GDP of Zimbabwe.

The contribution of beef value chain to public finances – taxes, subsidies, profits of public enterprises, etc. is known as the Public Funds Balance. The contribution of beef is modest at 0.5% of government earnings at US$21.5m.

The beef value chain adds to the trade deficit at US$72 million or 3% of total annual imports (i.e., imported Intermediate Good and Services).

Given the high level of value chain integration and relatively high contribution to agricultural GDP the potential impact of the beef value chain on growth would seem high.

Figure 27 disaggregated the total effects within the national economy. This shows that Intermediate Consumption (IC) accounts for only 23% of the total value chain production. IC is composed of Direct Imports (64% of IC) and Domestic IC (36%). In turn, domestic IC is the sum of Indirect VA which results from activities induced by the use of intermediate goods and services supplied by actors outside the VC limits and indirect imports which result from imports induced by the use of these intermediate goods and services supplied by actors abroad. Indirect VA and Indirect Imports can be computed using suppliers' accounts or national accounts where available. However, such specific "backward linkage calculations" are only required for a very small number of important intermediate consumptions (IC): those amounting to a substantial share of the total production value that may therefore significantly affect the assessment of the Indirect VA. In our study, the IC "by actor" and "overall" represent a very low proportion of total production value. Thus, we assume indirect imports are equal to zero (making domestic IC equal to indirect VA).

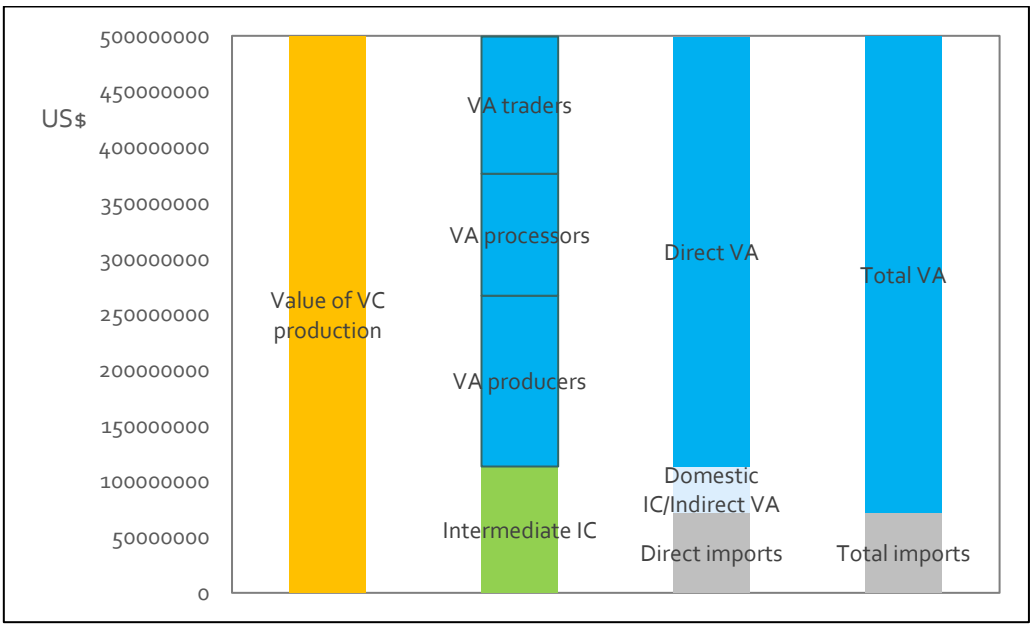


FIGURE 27: AGGREGATE IMPACTS OF THE BEEF VALUE CHAIN
Source: Interviews and AFA analysis

Direct Value Added (VA) is generated mostly by producers (40%), followed by traders (32%) and processors (28%) (see the aggregated account of the value chain in Annex 6). Total VA is mostly generated by Value Chain actors (91%), rather than by activities induced by IC.

3.6 Sustainability of viability within the global economy

Is the Zimbabwe beef value chain viable in the international economy? A Policy Analysis Matrix of the VC yielded the following results (Nb: assumptions on social and private parity prices and labour, tradable, capital and tax components of each product/cost item can be found in Annex 7).

Item	Tradable output	Tradable input	Labour	Capital	Net income
Private Prices	498,319,868 A	70,520,506 B	61,472,759 C1	33,345,747 C2	332,980,855 D
Social Prices	672,731,822 E	92,246,692 F	55,814,760 G1	30,489,337 G2	494,181,032 H
Transfers	174,411,954 I	-21,726,186 J	5,657,999 K1	2,856,410 K2	-161,200,177 L

TABLE 26: POLICY ANALYSIS MATRIX DATA
Nb: superscript letters are for reference in Table 27 below

The first and second columns of Table 26 show that the beef value chain suffered a negative transfer of US$174 million on its tradable output income but enjoyed a positive transfer of US$ 21.7 million on its tradable-input costs. If the government did not have an official fixed-exchange-rate regime and cash was sufficient, the VC actors would have had to pay US$ 21.7 million extra for tradable inputs but would receive an additional US$ 174 million for their product.

The third column in the table indicates that government labour taxes caused private wages for labour to be an estimated 10 percent higher than social wages; that is, the level that might have been expected without the policies. The result for the value chain was a negative factor transfer of US$5.6 million.

The factor transfer for capital was in the same direction. Although the actual interest rates being paid by actors are probably much higher than social interest rates (due the market failure of an underdeveloped capital market and government policies to ration credit), we assumed equal private and social interest rates to follow the methodological guidelines. The negative capital factor transfer of US$2.9 million is then explained by taxes paid on inputs and services with a capital component.

The net transfer is the sum of all divergences that cause private profits to differ from social profits. In the Zimbabwe beef value chain, all of the transfers were assumed to be the result of distorting policy, not of market failures. In sum, policy transfers were negative, indicating that the government was not providing supporting policies to the beef value chain. Because social profits were higher than private profits, the system could have operated more profitably without any policy transfers. These transfers reduced the profits actually received by actors in the value chain from US$494 million to US$333 million.

We constructed various ratios to allow comparison with other agricultural systems within the same country or across two or more countries (Table 27[29]).

Ratio	Abbreviation	Calculation (based on cells from PAM matrix)	Value
Domestic resource cost	DRC	(G1+G2)/(E-F)	0.15
Nominal Protection Coefficient on Tradable Outputs	NPCO	A/E	0.74
Nominal Protection Coefficient on Tradable Inputs	NPCI	B/F	0.76
Effective Protection Coefficient	EPC	(A-B)/(E-F)	0.74

TABLE 27: PAM RATIOS

The Domestic Resource Cost ratio (DRC) indicates the overall economic gain or loss for the national economy. This ratio gives an indication of the international competitiveness of the VC. Minimizing the DRC is equivalent to maximizing social profits. A DRC of 0.15 (less than 1) indicates a comparative advantage.

The Nominal Protection Coefficient on tradable Outputs (NPCO) of 0.74 indicates that policies caused output prices to be 26 percent lower than they would have been if world prices had been allowed to set domestic prices. The Nominal Protection Coefficient on tradable Inputs (NPCI) of 0.76 showed that costs of tradable inputs were only 76 percent of what they would have been at world prices. The Effective Protection Coefficient (EPC) is a single indicator that combines these two results by using the data from both. It is a useful measure of the combined effects of commodity price policies, but it does not account for any effects of policy in factor markets. An EPC of 0.74 indicates that the net impact of government policy influencing product markets is to constrain the beef value chain to have a value added in private prices 26 percent lower than the value added without policy transfers (as measured in world prices).

3.7 Growth inclusiveness

This measure considers how the income from the beef value chain shared among economic actors and how individuals, households and businesses benefit and share from the operation of the beef value chain.

Production and transformation functions account for over half of the net income of all the beef value chain actors (56%). The production function has the highest consumption of the sector (80%). Setting aside family labour on the majority of farms, the primary source of employment in the beef value chain is trade (59% of salaries).

In terms of income retention, analysis of how income from beef value chain operations is distributed among households and businesses shows that farmers receive 31% of all income, processors, 26%, traders 23%, workers 11%, land owners 5% and government 4% (see Figure 28).

[29] For a more detailed explanation of the method and the ratios used see: Monke E A and Pearson S R (1989), "The Policy Analysis Matrix for Agricultural Development", Cornell University Press, Ithaca NY.

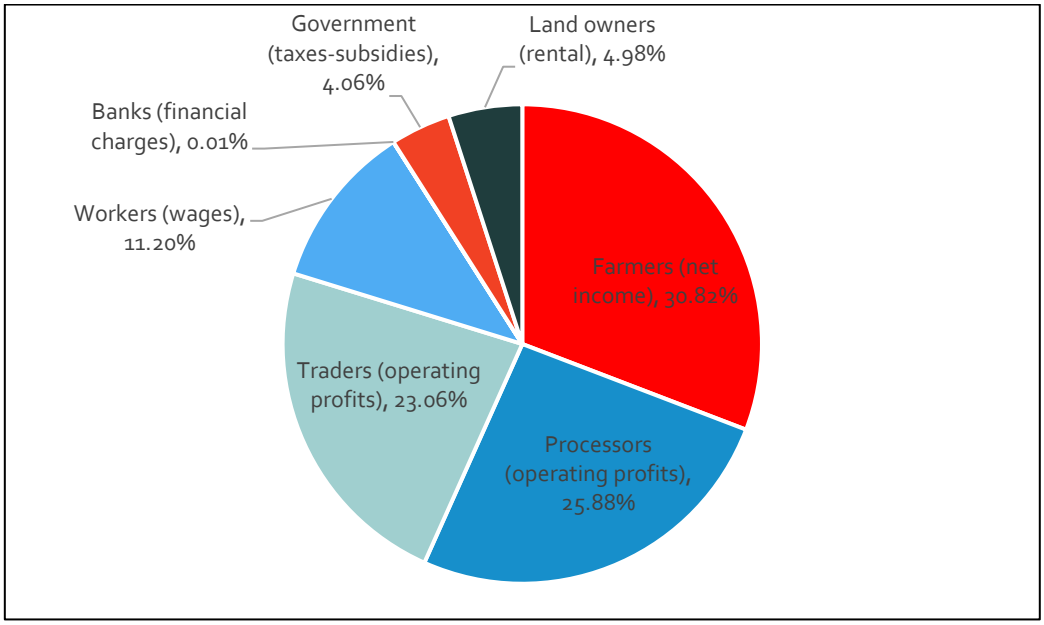


FIGURE 28: INCOME DISTRIBUTION BY VALUE CHAIN ACTOR
Source: Interviews and AFA analysis

Estimated net profits (or income in the case of farmers) is summarised below in Table 28. In this analysis the aggregate contributions by farmers, processors and traders to the value chain is demonstrated (79%).

Actor	Net income (US$)	Net income (%)
Farmers (net income)	122,194,945	30.82
Processors (operating profits)	102,621,355	25.88
Traders (operating profits)	91,423,990	23.06
Workers (wages)	44,391,614	11.20
Banks (financial charges)	21,733	0.01
Government (taxes-subsidies)	16,091,026	4.06
Land owners (rental)	19,743,461	4.98

TABLE 28: SUMMARY OF ESTIMATED ACTOR PROFITS
Source: Interviews and AFA analysis

Without undertaking the same analysis for other value chains in Zimbabwe and elsewhere a judgement on the fairness or efficiency of income distribution in the Zimbabwe beef value chain can only be subjective. However, it is possible to say that traders and processors together take a large proportion of the income. Whist this proportion is not unusual in agricultural value chains, it is notable.

How do operating profits, wages and taxes compare with normal returns in the economy? Operating profits for most actors appear normal given the risk profile and economic uncertainties faced by the Zimbabwe economy. Wages reflect national minimums for less skilled workers and norms for the Southern African region at the Managerial end. Taxes are largely contributed by Communal farmers (see Figure 28), suggesting that the current system is not progressive (e.g., it is

taxing poorer rather than richer actors), although this impression may be distorted by the disproportionate number of Communal farmers compared to other actors.

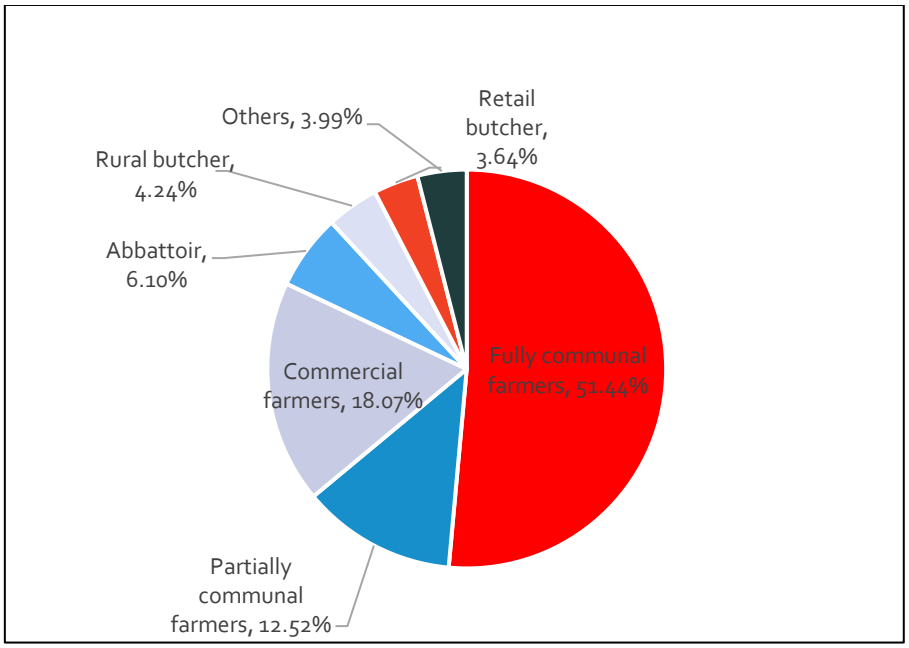


FIGURE 29: CONTRIBUTION OF TAXES BY ACTOR
Source: Interviews and AFA analysis

Consumables are an important indicator of integration into value chains. We found that the purchase of consumables was dominated by Full Communal and partially Communal/Commercial farmers (see Figure 30 below). These groups are over-represented because they purchase (non-beef) consumable into the value chain whereas Communal farmers have very limited purchases from outside the value chain. Other actors are under represented in this analysis because their purchases are from within the value chain (e.g., abattoirs who purchase animals for slaughter). The key consumables purchases are veterinary drugs and chemicals.

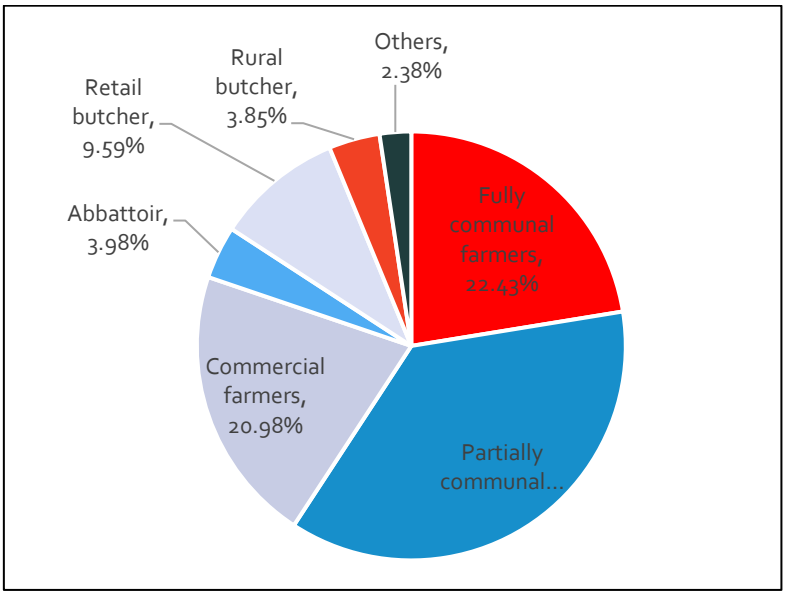


FIGURE 30: CONSUMPTION OF CONSUMABLES BY ACTOR
Source: Interviews and AFA analysis

Wages. Another indicator of inclusiveness is the contribution that wages and employment makes along the value chain. In Figure 29 we show that, since family income is not included in the economic analysis of fully and partially communal farms, wages are more important in commercial farms (28.18%) and further down the value chain, particularly from the abattoir (11.88%) onwards. It is noticeable that commercial farms (28.18%) and catering establishments (27.63%) the largest shares of the overall salary bill in the value chain. This demonstrates the domestic, consumer facing nature of the current beef value chain in Zimbabwe.

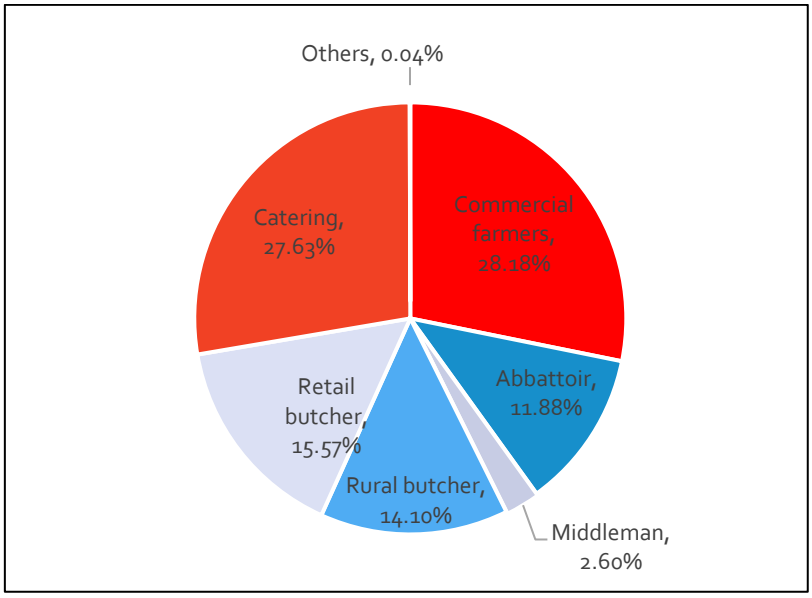


FIGURE 31: WAGE SHARE BY DIFFERENT VALUE CHAIN ACTORS
Source: Interviews and AFA analysis

Employment and vulnerable groups. Table 29 summarised the estimated jobs created by the beef value chain according to the AFA calculations. Note that this is based on throughput, so some sectors may seem under represented (e.g., meat processing) because beef is only an sub-element of their total production.

Actors	Job category	Number of jobs created	% of TOTAL
Commercial farmers	Managers	632	
	Workers	5,686	
	Total	**6,318**	**6%**
Rural butchers	Assistants	12,518	
	Blockmen	12,518	
	Total	**25,036**	**23%**
Traders	Managers	770	
	Buyers	770	
	Hands	770	
	Total	**2,310**	**2%**
Abattoirs	Accountants	289	
	Directors	289	
	Drivers	868	
	Foremen	289	
	Guards R Response	307	
	Guards on site	579	
	Marketing	579	
	Plant managers	289	
	Quality control	289	
	Secretaries	289	
	Workers	5,784	
	Total	**9,851**	**9%**
Meat processors	Accountant	3	
	Drivers	3	
	Guards	3	
	Guards R Response	2	
	Managers	2	
	Marketing	3	
	Supervisors	2	
	Workers	24	
	Total	**42**	**0.0%**
Retail butchers	Blockmen	7,275	
	Cashiers	7,275	
	Drivers	7,275	
	Sales	7,275	
	Total	**29,100**	**26%**
Caterers	Cashiers	4,089	
	Cooks	16,356	
	Guards	4,089	
	Managers	4,089	
	Waiters	16,356	
	Total	**36,804**	**34%**
ALL	**TOTAL**	**109,461**	

TABLE 29: ESTIMATE OF BEEF VALUE CHAIN JOB CREATION

Nb: The figures in this table are those directly employed by the value chain. This does not include self-employment or temporary workers

Source: AFA

If we assume that Communal farmers, whilst being in the majority of farmers in Zimbabwe are also the most marginalised and vulnerable, then we can conclude that additional returns to beef cattle ownership will accrue disproportionately to them as long as they can fully capture the benefits. We can also see that employment in the commercial sector is relatively low. Movement of farmers from the Communal and Partially Communal/Commercial categories of production is likely to result in an increase in formal employment.

The largest employing segments of the beef value chain are caterers (34%), retail butchers (26%) and rural butchers (23%).

AFA calculated that the informal retail employment (e.g., peripatetic meat traders) are 6,972. We consider this to be an under-estimated. Also, this group would seem particularly vulnerable as they fall outside the legal system in Zimbabwe and are very low waged.

The Zimbabwe economy is not generating large numbers of jobs outside the mining sector. The potential for job creation in the beef value chain would seem strong. These can be generated by both vertical and horizontal integration: for example, by commercial farm consolidation and movement from communal to commercial farming, by increased demand for abattoirs and meat processing facilities, and in the growth of beef sub-sectors not considered here such as leather and leather industries.

We conclude that the beef value chain has considerable potential for employment generation, but that some sectors are vulnerable to moving from informal to formal employment. We note also that there may be a trade-off between formal employment and food security/resilience for large numbers of communal livestock keepers.

3.8 Economic analysis: conclusions

The economic analysis addressed four issues: the financial viability of the value chain, the impact of the value chain on the national economy, the sustainability and viability of the value chain within the global economy and the inclusiveness of growth created by the value chain. In conclusion we consider the AFA findings that can be drawn within these dimensions.

Financial viability.

Before assessing the contribution of the value chain to the national economy several macro-economic factors need to be taken into account:

- After a period of relatively low inflation, Zimbabwe is currently seeing quite serious inflationary pressure.
- The economy is experiencing a lack of cash and foreign exchange as well as a range of different values for units of account.
- Considerable evidence of rent seeking was identified in the economy.
- The cost of doing normal business is very high and falls disproportionately on communal farmers who trade livestock
- The threat or promise of government intervention distorts current transactions and future investment decisions

All types of farm (Commercial, Partially Communal/Commercial and Communal) show profitability, particularly where capital costs and family labour are not included. The widely differing business objectives are a key factor. Commercials and Partially Commercial farms are profit oriented, whilst Partially Communal and Communal farms make profits, but aim to address other objectives such as: risk management, savings, social capital, status, milk production, and draft power.

All other actors in the financial analysis show strong profits in the range of 20-40%, particularly abattoirs.

We conclude that the beef value chain is both profitable and financially sustainable.

Impact on the national economy

The consolidated operating account shows that total value added from the beef value chain is US$427,363,320. This represents about 27% of total Agricultural GDP. We conclude from this that the potential for growth and contribution to the economy is also high. Total value added is mostly generated within the value chain actors demonstrating a high rate integration (0.87) and limited dependence on imports in the sector.

Viability within the global economy

The beef VC has a Domestic Resource Cost ratio of less than 1 (0.15) showing that the cost of domestic resources is lower than the economic value created by the VC measured with international prices (gain for the country), and this is another indicator of competitive advantage.

The Effective Protection Coefficient (EPC) for the beef value chain is 0.74. This suggests that the net impact of government policy influencing product markets is to constrain the beef value chain to have a value added in private prices 26 percent lower than the value added without policy transfers (as measured in world prices).

A Policy Analysis Matrix (PAM) for the beef value chain shows negative capital and labor factor transfers, which can be explained by taxes paid on inputs and services with capital and labor components. We conclude that the value chain has significant potential for trade and that the current policy regime is creating producer disincentives since profitability at market prices is less than profitability at opportunity costs.

Growth inclusiveness

Production and transformation account for 55% of the net income of the beef value chain. This suggests a high level of inclusiveness. Farmers retain 30.82% of the income from the value chain and this to a large extent represents the return to family labour across the different farming models. The element of wages in now relatively small in the beef value chain (11%) showing that the structure of the farming systems have normalised around family, rather than bought labour models.

Trading and processing retain a large proportion of total value chain income (49%). We conclude that a) the abattoir function is pivotal to value chain efficiency and equity, and b) potential exists for improved efficiency/competition in the area of live animal trading.

Operating profits seem normal in the beef value chain. For Communal farmers, veterinary drugs are a high proportion of purchased consumables, so improvement to the efficiency of their delivery would have a disproportionately beneficial impact on returns.

We can also conclude from the apparently positive set of economic indicators that a) all actors and the economy as a whole would benefit from sector growth, and, b) integration of new actors, particularly producers, into the value chain would have both financial and economic benefits.

4. SOCIAL ANALYSIS

4.1 Introduction and background

Social analysis explores whether the beef value chain is socially sustainable. It investigates the existing social conditions and social relationships in the value chain, considering national policies and the institutional context in which the value chain functions, as well as local level conditions, including local norms and values and informal institutions. The social analysis contributes to the discussion on whether potential economic growth in the value chain can be socially inclusive. It identifies the positive and negative social impacts, potential risks and benefits of the development of the value chain.

The investigation is structured around six domains: 1) working conditions, 2) land and water rights, 3) gender and social inclusion, 4) food and nutrition, 5) social capital, and, 6) living conditions. The social analysis draws on multiple and diverse sources, including national statistics (ZimStat reports), data collected through baseline surveys from different development projects (e.g., FAO-UE livestock project), and information collected during our fieldwork (through interviews and focus group discussions conducted during the second field mission, see Table 30).

For each of these six domains, a set of questions (with a total of 22 questions) guides the analysis. At the beginning of each section of the social analysis, a table presents the main findings for the domain and the appreciation (not at all/ moderate-low/ substantial/ high) attributed for each question. "Not at all" indicates drawbacks and potential risks while "high" indicates positive conditions and potential social benefits.

Date	Location	Participants
02/12/2018	Chiredzi, DSV office	Staff of the District Veterinary Services
02/12/2018	Muteyo, Animal Health Management Center	Farmers (men and women)
02/13/2018	Chiredzi, rural area	Feed lot Committee
02/13/2018	Chiredzi, rural area	Rural Women
02/15/2018	Nandia, Primary School	Pupils (9 to 12 years old)

TABLE 30: INTERVIEWS AND FOCUS GROUP DISCUSSIONS CONDUCTED FOR THE SOCIAL ANALYSIS

This analysis faced a number of challenges. For example, it deals with sensitive issues in the context of Zimbabwe such as workers' rights and land reform. It was not always possible to freely discuss these tough topics with our respondents. We are moreover aware that our analysis would have benefited from a deeper exploration (e.g., visit of farm workers' housing, focus groups with farm and slaughterhouse worker etc.).

Given the limited time available for the study, we choose to focus our analysis on two segments of the value chain: farms and, to a lesser extent, slaughterhouses. The working conditions and livelihoods of others stakeholders, such as workers in the feed industry, middlemen etc. consequently are little documented here. This choice was driven by the fact that the majority of people engaged in the beef value chain are farmers. Moreover, the other sections of the value chain (e.g., feed and drug supplies) are not specific to the beef value chain and may be driven by other

value chains (e.g., the poultry value chain). In Zimbabwe, cattle are much more than a commodity and have many other functions at the farm level, such as providing draft power, fulfilling social obligations, serving as a form of savings, and producing manure, milk and secondarily meat. It therefore is difficult to isolate the beef value chain from the numerous practices and values related to cattle.

4.2 Main functions of cattle

In order to understand the social dimension of the beef value chain, it is important to first present the different functions assumed by cattle at the farm level. Indeed, cattle are much more than a commodity or source of income. They have many other functions such as providing draft power, fulfilling social obligations, providing a secure form of savings, and producing manure, milk and secondarily meat. Developing the beef value chain, and then developing cattle as commodities, may impact the other functions of cattle.

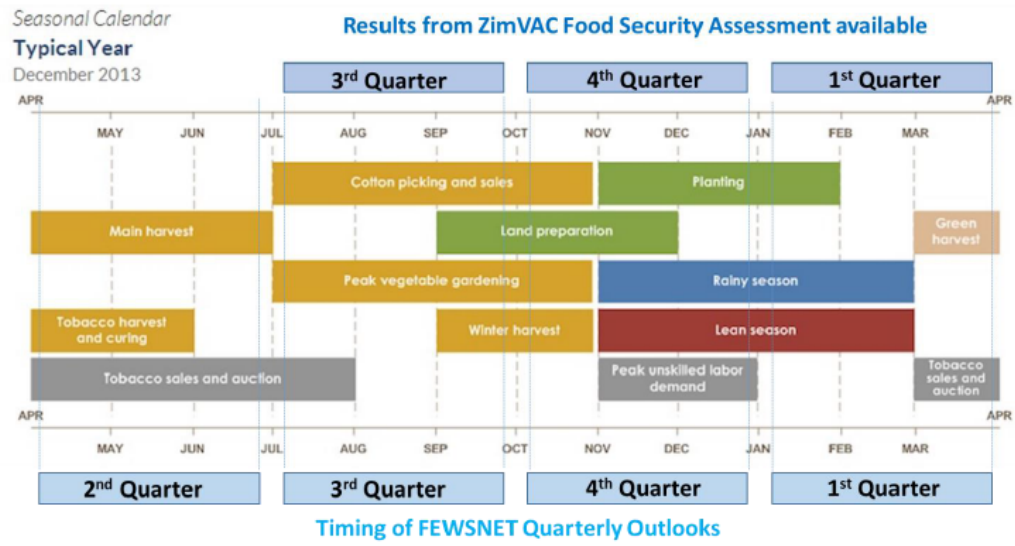
4.2.1 Draft animal power

One major function of cattle for most cattle owners (i.e., communal farmers) is to provide draft power. The use of draft animals is widespread in Zimbabwe (related to the low number of tractors, see Table 31).

Item	Communal farms	Old resettlement	A1	Small scale commercial farms	A2	Large scale commercial farms
No. of tractors per farm	0.001	0.014	0.012	0.059	0.535	1.731
No. of draft animals per farm	1.2	3.2	1.7	2.1	1.8	2.3

TABLE 31: NUMBER OF TRACTORS IN DIFFERENT TYPES OF FARMS
Source: Zimstat, Agriculture and Livestock Survey, 2015b,c,d,e,f,g

Cattle are mainly used for ploughing in heavy soils while donkeys are used for lighter operations such as weeding or transport. Peak demand for animal power is at the end of the dry season (see Figure 32) when animals are in their worst condition and feed resources are at their lowest (Muvirimi and Ellis-Jones, 1999).



Broadly, it would be expected that the findings from these two data sets would reflect the following:

- **April – June**: Harvest period, lowest levels of food insecure populations/better food security situation expected
- **July – September**: Moving away from harvests, could be a rise in levels of food insecure populations/food insecurity can begin to deteriorate – particularly if in bad year and winter harvests reduced/fail
- **October – December**: Start of the lean season, expected rise in levels of food insecure populations/food insecurity begins to deteriorate – if in bad year, numbers greatly increase
- **January – March**: Lean season and pre-harvest period, expected highest number of people classified as food insecure/food insecurity situation most difficult

FIGURE 32: SEASONAL CALENDAR
Source: United Nations World Food Programme (2014)

For those with no cattle, hiring draft power is an option. There is a social obligation to share draft power with those who do not own animals through arrangements like lending and payment in kind or in cash. Access to draft power relies on social ties based on kinship, friendship, and church (Mavedzenge et al., 2006).

4.2.2 Social and religious life

Livestock also play a central role in social and religious life (van Eckert, 1989). This role can be understood through the tradition of the 'Lobola'. 'Lobola' is defined by Chigwedere (1982, quoted by Van Eckert, 1989) as “all payments made by the bridegroom and his party to the father-in-law and his party to secure the service of the bride”. As a bride’s main service is to give birth to children, 'Lobola' can be seen as a type of child insurance. Van Eckert gives an example: “For example is a man divorced a wife for whom he had paid six cattle after she had given birth to three, his father-in-law will refund him three head of cattle”. As an indicator of the value of cattle, a man who cannot pay a 'Lobola' would have to work 10 years for his father-in-law. In fact 'Lobola' is a flexible system: goats can replace cattle and the 'Lobola' is the result of negotiation between the two families involved in the marriage (van Eckert, 1989).

Cattle also play a role at other important moments of social life. For example, cattle (and a goat) can also be slaughtered for the birth of the first child; a heifer may be given by the groom to his mother-

in-law after 2 or 3 children are born. Funerals also are an occasion to ritually kill an animal, roast it and share the meat with those attending the funeral. Cattle are also used for ancestor worship.

4.2.3 Saving

Cattle also have a major role as a form of savings. When asked why they do not sell more cattle, one participant in a focus group answered: "Would you find it reasonable to clear out your bank account all at once?" In the present context in Zimbabwe, where banks are unable to supply their clients with cash, and where farmers have very limited access to credit, using cattle as a form of savings is a wise strategy. For many farmers, cattle are probably the most secure form of long-term investment that yields interest in the form of calves.

Cattle can also be sold in case of need (see above in the Functional Analysis the role of livestock in the farm and domestic life cycle), in particular for school fees. Cattle also can be sold in case of shocks like drought when home-produced staple foods are lacking. Cattle ownership thus is considered to be a major factor for household resilience.

4.2.4 Manure, Meat and Milk

Cattle also produce low cost manure. This is essential for households that lack cash to buy fertilizers and live in dry land areas where investments in fertilizer yield a low economic return most years (water being in this case the most limiting factor). Animals are only killed for meat production for exceptional reasons, like social and family events or for important visitors. Milk is more important for household consumption, and when there is a surplus it can generate a small income, mainly for women.[30]

4.2.5 Income source

For most small-scale farmers (i.e., the majority of farmers), selling cattle is not a regular source of income. Animals are sold when there is a special need for cash, not when their economic value is highest. For example, the sale of cattle depends on the maize harvest (cattle sales decrease when maize harvests are good) and increase at the start of the new school year when school fees have to be paid (Jan-Feb).

Milk production is directly used for home consumption but eventual surpluses are sold and used to purchase food. Selling ploughing and transport services can also be a substantial source of income ($20/acre), demand is particularly high in newly resettled areas.

Investing in cattle is risky. Cattle are very dependent on crop residues and pasture, and are subject to climatic uncertainty. Investments in improved breeds and feed may be jeopardized by health risks (tick-borne disease mortality), economic and financial instability, and low bargaining power with the other stakeholders in the beef chain.

30 Like for beef meat, milk production has decreased a lot, from 262 million litres in 1990 to 55 million in 2013, but is still in the hands of large scale commercial farms, Technoserve 2014.

Nevertheless, pen fattening activities are developing with the support of donors (EU, USAID) and NGOs (Amalima, CARE, Fintrac), with private actors such as abattoirs (Kaola Park, Sabie Meat), and more rarely with the support of governmental extension services. According to the experience of different projects, pen fattening can yield a high economic return: around 40% in 45 to 90 days.[31] This is possible thanks to the NGOs involved (e.g., Amalima, CARE, Fintrac) which provide technical advice, act as an intermediary with microfinance institutions (by guaranteeing the technical feasibility of the project) and facilitate the trading of the fattened cattle.

4.3 Working Conditions

This section explores the social acceptability of working conditions. It covers provisions and conditions with respect to labour rights, including freedom of association and collective bargaining, contracts, forced labour and discrimination. It considers child labour and the degree of school attendance when children are working in any segment of the value chain, and the extent to which they may be exposed to harmful jobs. Job safety along the value chain is also considered, including the degree of protection from accidents or health damage provided workers while working. Lastly, this section considers the attractiveness of jobs in the beef sector, in terms of levels of remuneration and appeal to youth. Table 32 sums up the main findings.

Social Assessment	Summary Findings	Status
Respect of labour rights	Respect of labour rights is problematic in Zimbabwe. Most workers are self-employed, employed by their family or informally employed. These forms of employment are not covered by the Labour Act (wages, working hours etc.). The fast track land reform contributed to the expulsion with no compensation of numerous farm workers. Members of trade unions may be victims of harassment. In the beef value chain, the best working conditions are encountered in the large scale abattoirs.	Moderate/Low
Child labour	Children are little involved in the beef value chain (compared to other agricultural and non-agricultural sectors), except for herding.	Substantial
Job safety	Job safety is an issue in drugs companies due to exposure to harmful agrochemicals. In large-scale abattoirs, workers indirectly benefit from the numerous controls by vet and hygiene services.	Moderate/Low
Attractiveness	Due to the high level of unemployment in Zimbabwe any paid job is attractive. For animal herding, wages are low (under the minimum wage) but it is a way to build up a herd. In large scale abattoirs, wages are higher and come with different in-kind advantages.	Substantial

TABLE 32: WORKING CONDITIONS - MAIN FINDINGS AND SCORING

Agriculture, fishery, and forestry represent the main sources of employment in the formal (67%) as well as in the informal (70%) sectors (ZimStat, 2015a:83). The labour force in the beef chain includes those working on farms (as self-employed, family work and external farm work), in agro-industries (abattoirs, feed companies…) and in beef and beef products trade. Since data are scarce, this section focuses mainly on work at the farm level and in slaughterhouses.

[31] We consider here the initial value of the animal to be $250, the cost of pen fattening $320 (based on the fattening contract proposed by Koala Park), and the selling price of the fattened animal $800, after 45 to 90 days.

Land reform has changed the profile of the agriculture labour force. Land distribution has increased participation with over 300,000 newly resettled farmers. In parallel, the number of workers officially employed on commercial farms has decreased from 500,000 workers (employed on 4,200 commercial farms before the land reforms) to 150,000 workers (employed on 200-400 commercial farms after the land reforms), (ILO, 2009). These workers have benefited little from land reforms (most of them being aliens/migrants) (see section land and water rights) and many of them have become street vendors in major cities (our interview).

4.3.1 Respect of Labour Rights

This section intends to answer to the following questions:

- To what extent do companies involved in the value chain respect the standards elaborated in the 8 fundamental ILO international labour conventions and in the ICESCR and ICCPR?
- Is freedom of association allowed and effective (collective bargaining)?
- To what extent do workers benefit from enforceable and fair contracts?
- To what extent are risks of forced labour in any segment of the value chain minimised?
- To what extent are any risks of discrimination in employment for specific categories of the population minimised?

International conventions and national standards

International standards conventions

Zimbabwe joined the International Labour Organisation (ILO) upon gaining independence in 1980 and has currently ratified a number of international conventions related to labour rights (see Table 33). In particular Zimbabwe ratified:

- ILO Convention 87 on freedom of association and protection of the right to organize, in 2003
- ILO Convention 98 on the right to organize and collective bargaining, in 1998

Zimbabwe also ratified in 1991 the following UN conventions:

- ICESCR, International Covenant on Economic, Social and Cultural Rights (United Nations, 1966/1976b)[32]
- ICCPR, International Covenant on Civil and Political Rights (United Nations, 1966/1976a)[33]

These conventions deal with freedom of association, right to organise and collective bargaining, abolition of forced labour, minimum age for work, abolition of worst forms of child labour, equal remuneration for men and women for work of equal value, no discrimination on the basis of race, creed or sex.

[32] http://www.ohchr.org/EN/ProfessionalInterest/Pages/CESCR.aspx, accessed 16thMarch 2018

[33] http://www.ohchr.org/EN/Issues/Education/Training/Compilation/Pages/InternationalCovenantonCivilandPoliticalRights(1966).aspx accessed 16th of March 2018

Convention No.	Title	Date
C14	Weekly Rest (Industry) Convention (no.14)	06.06.1980
C19	Equality of Treatment (Accident Compensation) Convention, 1925 (No.19)	06.06.1980
C26	Minimum Wage-Fixing Machinery Convention, 1928 (No.26)	16.09.1993
C29	**Forced Labour Convention, 1930 (No.45)**	27.08.1998
C45	Underground Work (Women) Convention, 1935 (No.45)	06.06.1980
C81	Labour Inspection Convention, 1947 (No.81)	16.09.1993
C87	**Freedom of Association and Protection of the Right to Organise Convention, 1948 (No.87)**	09.04.2003
C98	**Right to Organise and Collective Bargaining Convention, 1949 (No.98)**	27.08.1998
C99	Minimum Wage Fixing Machinery (Agriculture) Convention, 1951 (No.99)	16.09.1993
C100	**Equal Remuneration Convention, 1951 (No.100)**	14.12.1989
C105	Abolition of Forced Labour Convention, 1957 (No105)	27.08.1998
C111	**Discrimination (Employment and Occupation) Convention, 1958 (No.111)**	23.06.1993
C129	Labour Inspection (Agriculture) Convention, 1969 (No.129)	16.09.1993
C135	Workers' Representatives Convention, 1971 (No.135)	27.08.1998
C138	**Minimum Age Convention, 1973 (No.138)**	06.06.2000
C140	Paid Educational Leave Convention, 1974 (No.140)	27.08.1998
C144	Tripartite Consultation (International Labour Standards) Convention, 1976 (No.144)	14.12.1989
C150	Labour Administration Convention, 1978 (No.150)	27.08.1998
C155	Occupational Safety and Health Convention, 1981 (No.150)	09.04.1993
C159	Vocational Rehabilitation and Employment (Disabled Persons) Convention, 1983 (No.159)	27.08.1998
C161	Occupational Safety and Health Convention, 1985 (No.155)	09.04.2003
C162	Asbestos Convention, 1986 (No.162)	09.04.2003
C170	Chemicals Convention, 1990 (No.170)	27.08.1998
C174	Prevention of Major Industrial Accidents Convention, 1993 (No.174)	09.04.2003
C176	Safety and Health Mines Convention, 1995 (No.176)	09.04.2003
C182	**Worst Forms of Child Labour Convention, 1999 (No.182)**	11.12.2000

TABLE 33: INTERNATIONAL LABOUR CONVENTIONS RATIFIED BY ZIMBABWE
Source: Labour Research Services, 2010

National institutional and regulatory framework

At the national level, the institutional and regulatory framework in relation with labour rights is mainly defined by:

- The National Labour Act. It sets out the rules and regulations related to freedom of association, collective bargaining processes and conditions of employment.
- The Employment Council (EC, known previously as NEC, National Employment Council). This Council is in charge of organizing collective bargaining for setting minimum wages in different sectors.

EC AI (Employment Council for Agricultural Industry of Zimbabwe) is a special branch of NEC covering workers employed in the agricultural sector. It is divided into 6 sectors: general agriculture/horticulture/"agro" (agroindustry)/tea and coffee/timber/kapenta.[34]

EC AI gathers employers' organisations [Zimbabwe Agricultural Employers Organisation (ZAEO), Zimbabwe Commercial Farmers Union (ZCFU), Zimbabwe Farmers Union (ZFU), Commercial Farmers Union (CFU), Zimbabwe Tobacco Association (ZTA), Zimbabwe tea growers' association] and Trade Unions/employee associations [Horticulture, General Agriculture and Plantation Workers' Union of Zimbabwe (HGAPWUZ) and General Agriculture and Plantation Workers' Union of Zimbabwe (GAPWUZ)].

In relation to the beef value chain, EC AI activities cover workers in livestock farms (in the general agriculture section) and workers in abattoirs if these abattoirs are located on farms (e.g., Binder abattoir). Workers in abattoirs located in cities (e.g., Cold Storage Company, Koala) are covered by the EC Food and Allied Industries branch, as are workers in the food processing industry.

Labour rights

The Labour Act stipulates that an employee should be at least 15 years old, should be given at least one day free/week, one month free/year, and 12 days special leave for various reasons (compassionate, business). Maternity leave is officially 3 months. Minimum wages are defined by activity sector (in the framework of the EC). In 2017, the minimum wage for farm workers was increased from US$72 to US$75 [with the highest paid worker now earning US$150, (NEC, 2017)].[35] The general agriculture sector remains the least attractive sector in terms of wages (see Table 34).

[34] Kapenta is the name used in Zimbabwe and Zambia for the Tanganyika sardine and the Tanganyika sprat. There are large kapenta fisheries in Lake Kariba.

[35] http://www.cfuzim.org/images/si9617wages.pdf accessed 16th of March

Sector (date of the last agreement)	Min wages (grade A1) $/month	Max wages (grade C2) $/month
EC AI, subsectors:		
General agriculture (June 2017)	75	150
Agro (Nov. 2017)	105	208
Horticulture (Dec 2014)	82	162
Tea and coffee (May 2017)	83	164
Kapenta (April 2017)	143	286
EC Food and Allied Industries (2012):		
Meat, Fish, Poultry and Abattoirs	213	
EC other sectors		
Mining (2015)	245.56	
Cement, lime and allied industries	328.65	
Manufacturing	198	
Sugar milling	170	
Tourism	248.65	

TABLE 34: MINIMUM WAGES PER SECTOR
Source: NEC, Collective bargaining agreement.
Nb: Grades include A1 (min), A2, A3, B1, B2, B3, B4, B5, C1, C2 (max)

Moreover, EC stipulates that employees should receive allowances. For the Agricultural Industry sector, employers should provide allowances in kind or value for transport (actual cost), $35 for accommodation, $8 for fuel and $10 for electricity. For workers in the Food and Allied Industries sectors, allowances are $51 (for housing) and $44 (for transport).

This minimum wage keeps farm workers under the total consumption poverty line (TCPL) [defined at $102 by Zimstat, (Zimstat, 2015a: 58); the food poverty line (FPL) being at $31.7).[36] Moreover, in a context of cash shortage, many workers (in the commercial sectors) are paid with "plastic money". As there is a de facto price differential of around 20% between cash and "plastic money", we can estimate that these workers lose around 20% of their purchasing power.

While this national framework is considered to be overall in line with international standards (USAID, 2016), certain improvements are needed. For example, according to the ILO, the right to strike is not fully guaranteed by the Labour Act: the national legislation includes disproportionate sanctions for the exercise of this right in relation to an excessively large definition of "essential services"; this is seen as a way to criminalise striking. Moreover, the legislation [Labour Act, section 51 and 120(2)] allows interference by the authorities in the financial affairs of trade unions and in the supervision of the elections of trade union officers (ILO, 2009).

The major problem is the low level of enforcement of the legislation. Most employees are in the informal sector (70% in the agricultural sector, according to ZimStat (2015a). These workers are not covered by official rules and regulations in terms of wages and hiring and firing conditions (USAID,

[36] Zimstat (2015) estimates that 67% of paid employees (all sectors) are above the FPL and 42% above the TCPL.

2016). EC and trade unions only deal with workers in the formal sector; in the agricultural sector, EC AI and farm workers' unions (i.e., GAPWUZ, HGAPWUZ and PAAWUZ) deal only with workers involved in A2 farms and commercial farms (but they could in principle receive complaints from all types of workers). In communal and A1 farms, working conditions depend on personal arrangements.

The land reform program is a particularly hot issue in relation to farm workers. As a result of the changes in the rural sector, a large number of farm workers have become unemployed. They have been evicted by the new farm owners (sometimes using violence). They have lost their employment, their houses and all of the services provided by their former employers (ILO report and our interviews).[37] Most have migrated with their families to cities, and have shifted to new activities such as street vending. The compensation that these workers are supposed to receive (they are about 30,000 farms workers waiting for compensation)[38] from their former employers (white commercial farmers) for ending their contracts (the 'retrenchment package') is dependent on the tricky issue of the white farm owners' compensation (our interview with EC). This issue is mainly related to farms with a high number of workers (crops, horticulture) rather than farms dedicated to livestock.

Zimbabwe has been regularly pointed out by international organizations for not respecting human rights and in particular labour and association rights. We examine these issues in more detail below, in the specific case of the agriculture sector and when possible in the context of the beef sector.

Compliance with Freedom of association and collective bargaining

Freedom of association

According to Zimstat (2015a: 61), 14.8% of the population in paid employment are members of an employee association. Some of these associations are clearly State controlled. Others face regular violations of their rights.

Since 1996, many complaints have been addressed to ILO relating to the violation of freedom of association rights in Zimbabwe.[39] In 2009, a Commission of Inquiry[40] was set up by ILO to examine Zimbabwe's observance of the Right to Organise and Collective Bargaining Convention, 1949 (No. 98), and the Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87). The report noted the "systematic targeting of Zimbabwe Congress of Trade Unions (ZCTU) officials and members, particularly in rural areas; calculated attempt to intimidate and threaten ZCTU members; routine use of the police and army against strikes, widespread interference in Trade Unions affairs, impunity for those perpetrating atrocities". During past elections periods, members of trade unions, including in the agriculture sector, have been victims of intimidation and harassment [our interviews, the ILO Commission's report (2009) and the International Trade Union Confederation's report (2011)].

[37] A survey conducted in Mvurmi (Mashonaland Central Province) shows that 8.6% of A1 plots owners are former farm workers (Scoones, 2018)

[38] https://www.dailynews.co.zw/articles/2018/02/12/farm-workers-to-finally-receive-their-dues accessed 16th of March

[39] See also https://www.ituc-csi.org/IMG/pdf/Zimbabwe_TPR_report-16_oct_.pdf, accessed 16th of March

[40] The report "Truth, reconciliation and justice in Zimbabwe" is available at http://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_126394/lang--en/index.htm, accessed 16th of March

The recommendations of the ILO Commission's report (2009) focused on the need for legislative reforms, the cessation of anti-union arrests, detentions, violence, torture, intimidation and harassment, interference and discrimination. The report also recommended the strengthening of national institutions and social dialogue; training on freedom of association and collective bargaining, civil liberties and human rights; and the reinforcement of the rule of law and the role of the courts.

Compliance/observance of the convention on collective bargaining

Collective bargaining regulations and legislation are covered by the Labour Act. In most sectors, including the agriculture one, it is organized by the Employment Council (EC). The Zimbabwe Agriculture Employers Association (ZAEO) defends a freezing of farm workers' wages due to a decline in the agriculture economy and productivity.[41] Connivance between farm owners and government officials (who may also be farm owners, and beneficiaries of the land reform) to limit increases of farm workers' wages has been denounced in the past in EC negotiations. Nevertheless, as mentioned above, the minimum wage for farm workers was increased in 2017 from $72 to $75.

Contracting, enforceable and fair contracts

As mentioned above, the majority of workers are self-employed or do not benefit from a formal contract. In the beef value chain, this is also the case with the exception of the commercial sector.

The official minimum wage in agriculture keeps farmers under the poverty line. Furthermore, most of the time, this minimum is not respected. Farm workers receive low daily wages ($2.5 to $3), sometimes justified by the fact that they also receive staple food, or because they live as quasi-family members (and have an intermediary status between family and workers) (our interview).

The Labour Act stipulates that workers should be given at least one day free/week, and one month free/year. However, we met workers working 7 days a week (e.g., a butcher employee in Chiredzi). Complaints addressed by workers to their Union are mainly in relation with work days exceeding 12 hours (our interview).

In abattoirs and butcheries, activities may be interrupted in case of quarantine (as a consequence of animal disease outbreaks) or when heavy rains interrupt the circulation of trucks and the collect of cattle (as happened during our mission). When this is the case, workers may be assigned to other activities, against their will (e.g., sugar cane farming in Chiredzi), or may be unpaid during the interruption. In 2017, due to an FMD outbreak that slowed down the slaughtering activity, workers were suspended from work without pay for 3 weeks (our interviews). Workers can also suffer delays in the payment of their wages (e.g., workers of the Cold Storage Company - interviews).

Forced labour

The law prohibits forced labour: Article 54 of the new constitution states that, "No person may be subjected to slavery or servitude", and Article 55 that "No person may be made to perform forced

[41] http://source.co.zw/2014/11/wage-deadlock-in-agric-sector/, accessed 16th of March

or compulsory labour" (Rep. of Zimbabwe, 2013b). However, according to the ITUC report, the penalties prescribed for forced labour are not adequately stringent.

During our mission, we did not hear of or come across any case of forced labour in to the beef value chain (except the example mentioned above). Nevertheless, problems have been reported: the ITUC report (ITUC, 2011) mentions cases of forced labour mainly in mining but also in seized farms, where the individuals to whom the farms were given have sometimes forced workers who wished to remain in their homes into unpaid labour.[42]

Discrimination

Zimbabwe ratified ILO Convention No. 100 (1951) on Equal Remuneration in 1989 and ILO Convention No. 111 (1958) on Discrimination (Employment and Occupation) in 1999. The Labour Act prohibits discrimination on the grounds of race, gender, HIV/AIDS status and disability in all aspects of employment and occupation.

We did not hear about cases of discrimination during our fieldwork. Nevertheless, problems (not specific to the beef value chain) have been noted in different reports. For example, farm workers, mainly because they were foreigners, did not benefit from the agrarian reform. Women too have been discriminated against (see below). Other reports show that in certain regions Ndebele and whites are often victims of discrimination in employment, including hiring practices (ITUC, 2011).[43]

FIGURE 33: EXAMPLE OF A LARGE SCALE ABATTOIR IN ZIMBABWE
Source: Photo credit, Muriel Figuié (2013)

[42] http://allafrica.com/stories/201706120164.html, accessed 16th of March 2018

[43] Zimbabwe's main ethnic groups are the Shona, representing 82% of the population, the Ndebele, representing 14%, and whites and other groups, representing less than 4%.

4.3.2 Child Labour

In 2000, Zimbabwe ratified the ILO Minimum Age Convention, 1973 (No. 138) and the ILO Worst Forms of Child Labour Convention, 1999 (No. 182). At the national level, the Labour Act stipulates that an employer should be at least 15 and an apprentice 13 (any employment contract with an employee between the ages of 13 and 15 should be signed by the apprentice's legal guardian). The Labour Act also stipulates "… no employer shall cause any person under the age of 18 years to perform any work which is likely to jeopardise that person's health, safety and morals which work shall include but not limited to work involving such activities as may be prescribed…" (LRS, 2010). Moreover, the national legislation (Article 81/1) protects children from "economic and sexual exploitation, and from child labour, and from any form of abuse". In practice, there are few inspections and therefore the number of violations related to child labour is unknown (U.S. Department of Labour, 2012). In 2011, UNICEF conducted a survey on child labour in Zimbabwe.[44] It found that about 10% of children between the ages of 5 and 14 are engaged in economic activities. They are mainly orphans or children from poor families. These activities are related to mining (gold, diamond), domestic work and prostitution. Child labour in agriculture mainly is found in the production of tea, cotton, tobacco, and sugarcane.[45] In the context of Zimbabwe, children's involvement in the beef sector does not seem then to be a major issue compared to other activity sectors (e.g. tobacco plantation).

Nevertheless, from our own observation and different studies, child labour in the beef value chain exists at the farm level. Moreover, a study conducted in Nkayi and Lupane districts under the framework of the FAO-EU livestock project (EU, FAO, 2014) and Table 35, shows that boys are commonly involved in herding and/or milking (and/or to a lesser extent in collecting grass and feeding). Children's work in livestock may also include cleaning out cowsheds, manure disposal, and animal health management.

[44] https://www.unicef.org/zimbabwe/media_15205.html, accessed 16th March 2018
[45] https://www.dol.gov/ilab/reports/child-labor/findings/2012TDA/zimbabwe.pdf, accessed 16th March 2018

	Nkayi					Lupane				
	Adult Males	Adult Females	Boys	Girls	Hired Labour	Adult Males	Adult Females	Boys	Girls	Hired Labour
	% yes					% yes				
Purchasing cattle	84.5	27.5	4.5	0.0	0.0	84.0	50.9	8.6	1.2	1.8
Selling/ slaughtering	84.5	29.0	4.0	0.0	0.0	81.6	58.3	8.6	1.2	0.6
Herding	42.5	3.5	57.0	1.0	16.0	59.5	19.0	62.6	2.5	20.9
Breeding decisions	78.5	19.0	9.0	0.0	0.5	79.8	23.3	21.5	1.2	1.8
Feeding	53.0	12.0	29.0	2.0	6.0	68.7	36.8	41.1	9.2	11.7
Milking	48.5	5.5	50.5	1.5	9.5	56.4	25.8	55.2	8.6	16.6
Making dairy products	1.0	49.0	1.5	1.0	0.0	14.1	78.5	4.3	12.3	2.5
Selling dairy products	0.5	8.5	0.0	0.5	0.0	7.4	35.0	3.7	4.3	1.2
Animal health	71.0	16.5	22.5	1.0	8.5	77.3	36.8	36.2	1.8	11.7

TABLE 35: HOUSEHOLD MEMBERS RESPONSIBLE FOR CATTLE ACTIVITIES
Source: EU, FAO, 2014

We visited a primary school (in rural, peri-urban area) during our field visit and had a meeting with a group of children (around 60, from 9 to 12 years old) and their teachers to discuss children's involvement in farm work. Boys are involved in herding, girls in milking. Some of the boys (7) declared that they worked as herders during the weekend and holidays and enjoyed it. Those children without cattle at home declared that they enjoyed going herding with their friends. Attending a dip tank session with their father (and even sometimes replacing the father at a dip tank session) is seen as a "coming-of-age ceremony or ritual" /activity. Herding cattle is also perceived as a task with a high level of responsibility since it includes protecting cultivated fields from cattle as well as protecting the cattle from potential lion attacks (the school visited was not far from a wildlife conservancy).

FIGURE 34: FOCUS GROUP DISCUSSION IN RURAL PRIMARY SCHOOL
Source: Photo credit, Charles Chakoma (2018)

School attendance

The ILO raises the problems of child labour in livestock worldwide and its negative consequences on school attendance[46]: "Herders represent one of the most widespread and culturally accepted forms of children's work in many regions… Children in pastoral communities may spend many months as shepherds and herders in remote, isolated areas tending animals or participating in heavy work, such as leading livestock long distances to water sources. This lifestyle often impedes normal school enrolment and attendance…".
According to the UNICEF survey in Zimbabwe mentioned above,[47] children engaged in economic child labour (10% see above) are less likely to be in school; and of the total number of children aged 5 to 14 years engaged in economic labour, about 15% were not in school.

It is very common to see children, at any time of the day, any day of the week, herding cattle on the road-side. Nevertheless, we had a group discussion with women involved in cattle activities. All of these women confirmed that school attendance is a priority and that their children only contribute to farm work during weekends and holidays and in a very reasonable manner. This has been confirmed during our meeting with a school director and teachers: school attendance is not affected by the peak period of farm work. It happens, but only a few times a year when pupils ask permission to be absent in order to take their family cattle to a dip tank session.

Children's involvement in farm work is not necessarily totally detrimental to school attendance. A report from ITUC notes that children may be engaged in part-time work in order to pay their school

[46] http://www.ilo.org/ipec/areas/Agriculture/WCMS_172431/lang--en/index.htm, accessed 16th March 2018.
[47] https://www.unicef.org/zimbabwe/media_15205.html, accessed 16th March 2018

fees (ITUC, 2011). We have been told that in the past some companies (i.e., tea or tobacco companies) had a deal with some schools and parents. They paid the school fees for children in exchange for their involvement in farm work in the afternoon. This kind of arrangement is forbidden today.

Overall, cattle owning at the farm level is directly positively linked to school attendance. According to Muvirimi and Ellis Johnson (1999), "traditionally hand hoe cultivation was practiced widely but as available labour decreased due to increasing schooling, animal power assumed the importance now attached to it". More importantly, cattle generate income which is mainly used for paying school fees, as confirmed by our interview and numerous studies (EU, FAO, 2014; ICF, 2015).

Child Exposure to harmful jobs

According to the International Programme on the Elimination of Child Labour (IPEC) conducted by the ILO,[48] herding, shepherding and handling livestock maybe considered as hazardous work for children. "Injuries from animals include being bitten, butted, jostled, stamped on, gored or trampled. Large and small animals do not need to be aggressive to cause serious harm or even kill a child… Children rarely wear protective shoes or boots, and this increases their risk for additional injuries and illnesses such as cuts, wounds, bruises, thorn injuries, skin disorders, and infections. Diseases can be contracted through routine contact with animals, insects, pathogens in animal carcasses and work near livestock stabling areas and butchering houses. Exposure to crop dusts and contaminated plant material, water or soil can also pose a health hazard to children. Additionally, livestock dust can penetrate deep into the lungs causing health problems. Chemical products, including disinfectants for use in livestock production contain caustic or corrosive materials and may be stored in areas that are accessible to children. Fumes released when mixing and applying products can be a particular health hazard for children".

The hospital staff in Chiredzi did not report specific problems in relation to children's involvement in livestock activities. Three of the pupils met at the school reported an accident: one fell from a scotch cart, one had been badly kicked while milking, and one injured while ploughing.

4.3.3 Job safety

Zimbabwe has ratified Convention C 161 on Occupational Health Services (OHS, see above). In the national legislation there are several Acts related to OHS at work (National Social Security Act; Factories and Work Acts). The monitoring, valuation and enforcement of the regulations governing OSH at work is under the responsibility of the National Security Authority (NSA). However, Zimstat (2015a: 285) points out the weakness of the system: the informal sector is not covered.

A surveyed conducted by ZimStat in May 2014 showed that 5% of workers had suffered from work injuries over the past 12 months and 2% from work-related illness (Zimstat, 2015a: 256). Lack of personal protective clothing and equipment was cited as a problem by 32% of agriculture sector workers.

[48] http://www.ilo.org/ipec/areas/Agriculture/WCMS_172431/lang--en/index.htm, accessed 16th March 2018

In the beef chain, certain activities expose workers to potential professional risks more than others: drugs-related work, dip tanking and slaughtering (probably also in feed companies). We visited the storehouse of a drugs seller and could observe bad storage conditions (ripped packaging, strong smell of chemicals and absence of protective clothing for the workers).

We asked questions about possible accidents at dip tanks in relation to chemical use (acaricide), but no event was reported (except for one accident of cattle poisoning) and the dip tank attendants that we interviewed declared that they used protective clothes (but we could not attend any dip tank session due to bad weather conditions).

One of the rural slaughterhouses that we visited was narrow, with workers manipulating sharp tools in a narrow space. Workers in large-scale commercial abattoirs benefit from better working conditions: as hygiene is an important issue, they receive clean clothes and protective equipment. They may also benefit from medical follow-up (in one of the abattoirs visited, one nurse stays permanently; a doctor comes once a month).

Our visit to Chiredzi hospital did not allow us to discover specific professional risks related to the beef value chain. Accidents involving animals mainly were related to scotch cart and plough accidents, and crocodile bites (but fishermen are much more exposed to this than herders). Only few cases of a zoonotic disease (anthrax) following the consumption of contaminated meat were reported, and these took place several years ago.

4.3.4 Job attractiveness

As the official unemployment rate increased from approximately 80% in 2005 to 95% in 2009, any job is seen as very attractive in the current context. Except in areas with gold mines, farm work is the main job opportunity in rural areas.

Remuneration in accordance with local standards

Agriculture has among the lowest official minimum wage (see above Table 34). Within the agricultural sector, wages in the general sector (which includes livestock farms) are the lowest ($75). Wages in urban abattoirs are higher since they come under the EC “agro” category (also called the “commercial” sector), the minimum wage is $105 per month. Abattoirs workers also benefit from in kind advantages as mentioned above: as food cannot be brought into an abattoir (for biosecurity reasons), abattoir workers generally receive lunch (with meat). They may be given meat to take home weekly (1 kg of meat/week, in one of the visited abattoirs) or have access to meat at low prices (for example, offal at $2/kg - instead of $3.5/kg on the market - in another abattoir visited).

From our interviews, we collected different example of wages and working conditions (see Box 3):

Farm workers

An A1 farm near Bulawayo employs a worker for $60/month, working 5 days/week. The worker receives in kind advantages (e.g., staple food).

Another group of communal farmers in Chiredzi employs a worker to take care of their collective pen fattening project. He receives $150/month.

Communal farmers in Chiredzi and Bulawayo employ herders: these herders are paid $3 or $5/day. One of them receives $30/month (plus housing and food) and will receive a calf (for 2 or 3 years of work).

Butchery

A set of 4 butcheries in Bulawayo employs 12 workers, working 6 days/week for $300 to $380/month.

In another butchery in Chiredzi, the blockman works 7 days a week, 11 hours a day and receive $170/month.

Abattoir

One small-scale rural abattoir near Bulawayo (50 animals slaughtered/day) employs 46 people (1/4 of whom are women, working in the laundry). They work 6 days/week and receive $10/day, plus in-kind advantages such as food and housing.

A large-scale abattoir also near Bulawayo employs 140 workers - 110 males, 30 females - (there once was 500 workers in the past) including 40% casual workers. The minimum wage range is around $200/month for 5 days/week, 8h/day (but it used to cover the 3 daily 8-hour shifts in the past). Workers receive one meal a day and tea twice a day. One nurse stays permanently at the abattoir. A doctor comes once a month.

Another abattoir in Bulawayo (2500 kg of carcass/month) employs 26 to 30 workers (with ”temporary worker” status). There are paid by Econet (no cash) following the EC AI and Food and Allied Industries standards. Some of the workers live on-site and are housed, others benefit from free transportation. A health centre is also available on site.

Another abattoir in the rural area of Chiredzi (1100 cattle and 200 goats slaughtered each month) employs 46 male workers (and 2 females for cleaning). Workers are paid according to EC Agriculture standards; they receive lunch every day and 1 kg of meat/week.

In another abattoir in Chiredzi urban area (1500 cattle slaughtered each month, and goats), the work schedule is “flexible” according to the activity. Workers do not receive lunch and cannot bring lunch onto the site. They can buy meat at a subsidized price.

Input suppliers

This stock feed company produces 450 t of feed/month and employs 15 permanent male workers. The lowest wage is $300/month. During the period of peak activity (May-June), the company hires temporary workers.

In this drugs company, 70 workers are employed and work in a difficult environment (ripped packaging, strong smell of chemicals and absence of protective clothing).

BOX 3. CONDITIONS OF WORK IN DIFFERENT PLACES VISITED
Source: our interviews

Attractiveness for youth

The students whom we interviewed value the job of farmers and most of them wish to have a large herd when they grow up. Working as a herder is a way to begin a herd when payment takes the form of a calf.

In general, job opportunities are rare for young people in rural areas. When there are local opportunities to work in gold mines, some farms may struggle to find workers to hire (the official wages in the mine sector fall under the EC Mine agreement, and is $245.56/month).
In Chiredzi, the agricultural commercial sector also offers job opportunities in sugar cane plantations and industries. However, the workers interviewed (in butcheries and abattoirs) considered that their working conditions were much better that those of the sugar cane workers. The salaries are officially the same (according to EC Agro standards) but work in the sugar cane sector is considered to be harder (in particular due to night work and risk of injuries during the harvest season). All of the abattoir owners that we met declared a very low turnover among their workers.

Working in a commercial abattoir is an attractive job. Hygiene is important in large-scale abattoirs. That is why abattoir workers generally benefit from clothes and protective clothes (supplied by the employers) and health insurance. They work in a clean and "climatized" environment. The work is not seen as dangerous, injuries in the slaughtering chain are said to be rare.

4.4 Land and Water Rights

This section examines the social acceptability and sustainability of land and water rights. It covers potential large-scale investment projects involving the beef value chain: adherence to VGGT (Voluntary Guidelines on the Responsible Governance of Tenure), quality of the procedures (transparency, participation, and consultation), equity in land and water access, compensation and justice procedures in case of disruption or conflict in relation to this access. Table 36 sums up the main findings.

Assessment Category	Summary of Findings	Status
Adherence to VGGT	There is no reference to VGGT in the different projects that may affect farmers' access to land and water.	Not at all
Transparency, participation and consultation	In practice, the principles of VGGT have not been respected in the different projects that have affected land and water access in the past, such as 1) land reform, 2) conservation (park and wildlife management), and 3) FMD geographical control.	Not at all
Equity, compensation & justice	Many problems remain in relation to 1) the lack of compensation of white commercial farmers whose land has been seized and their workers, 2) the lack of compensation of farmers living on the edge of conservation areas and 3) the territorial approach of FMD control that is not inclusive. Mechanisms for conflict resolution are limited. Nevertheless, land reform has greatly contributed to a more inclusive beef value chain.	Moderate/low

TABLE 36: LAND AND WATER RIGHTS - MAIN FINDINGS AND SCORING

Access to shared grazing areas and water points is essential for most livestock owners. After disease, poor grazing and lack of water are the major causes of cattle death (Food and Nutrition Council and SIRDC, 2016). In periods of drought, cattle mortality increases dramatically. Any change in land and water access, and any constraints on herd mobility, can have an important impact on the entire beef value chain.

4.4.1 Adherence to VGGT

The questions on this topic explore:

- Do the companies/institutions involved in the VC declare that they adhere to VGGT?
- If large-scale investments for land acquisition are at stake, do the involved companies/institutions apply the "Guide to due diligence of agribusiness projects that affect land and property rights"?

VGGT is the result of an extensive consultation and negotiation process involving international organizations, representatives of states, civil society and the private sector. It sets out principles, technical recommendations and practices for improving the governance of land, fisheries and forests tenure (FAO, 2012) (see Box 4).

VGGT includes recommendations for a State (Article 8.3) to recognize and protect publicly-owned land, fisheries and forest and their related systems of collective use and management (i.e., communal lands in the Zimbabwean context), to protect the rights of vulnerable populations, including women in case of a change in their marital status (divorced, widowed).
It states that non-State actors including business enterprises have a responsibility to respect human rights and legitimate tenure rights. When transnational corporations are involved, their home States have roles to play in assisting both these corporations and host States to ensure that the business is not involved in the abuse of human rights and legitimate tenure rights.
Regarding responsible investments, VGGT principles (12.4) state that responsible investments should safeguard against dispossession of legitimate tenure right holders and environmental damage, and should respect human rights. They should strive to further contribute to policy objectives such as of poverty eradication, food security and sustainable use of land, fisheries and forests.
More importantly, in the context of Zimbabwe, VGGT also addresses issues related to redistributive land reforms (Article 15). It states that the State should clearly define objectives and beneficiaries (15.5) and should ensure that beneficiaries receive support required in terms of credit, insurance etc. (15.8). Beneficiaries should receive secure tenure rights, publicly recorded (15.9).

Box 4: The Voluntary Guidelines on the Responsible Governance of Tenure
Source: extracts from FAO (2012)

The Guide to due diligence of agribusiness projects that affect land and property rights draws on the work undertaken by members of the 'Land Tenure and Development Group' set up by French institutions. It addresses the specific question raised by the multiplication of agribusiness investment projects based on large-scale land acquisition. It provides a set of recommendations in order to guarantee that the investment project: 1) promotes an inclusive development model, 2) recognises and protects local land rights, 3) complies with national labour laws, and 4) guarantees

different users that they will have equitable access to water resources. The Guide states that projects should have a published feasibility study and an environmental and social impact assessment. Consultation with local people and communities should take place without manipulation, interference, coercion or intimidation and those potentially affected should have access to prior information before a decision is made (Technical Committee in Land Tenure, 2014).

None of the companies that the VC4D Study Team engaged with (abattoirs, stock feed companies, drug companies) made any mention of VGGT, and no examples of its use in the beef value chain were found during our study. Nevertheless, the fast track land reform process, launched in 2000, shows how the different points addressed by these guidelines are problematic in the context of Zimbabwe.

Moreover, the existence of conservation areas (national parks or private conservancies) also raises the issue of equity and respect of traditional rights in relation to land and water access. Finally, the geographic zoning used for FMD control before the fast track land reform could be interpreted as having been organized to essentially benefit large-scale commercial livestock farms whose social and economic inclusiveness has been questioned in numerous works (Figuié et al., 2015; Naziri et al., 2015; Perry et al., 2003; Scoones et al., 2010; Thomson, 2009).

A Land Commission Bill[49] has been set up recently to resolve land disputes and other issues related to the administration of agricultural land but its impact cannot yet been assessed.

4.4.2 Transparency, participation and consultation

The questions on this topic explore:

- Level of prior disclosure of project-related information to local stakeholders?
- Level of accessibility of intervention policies, laws, procedures and decisions to all stakeholders of the value chain?
- Level of participation and consultation of all individuals and groups in the decision-making process?
- Prior consent of those affected by the decisions?

To document this topic, we propose to focus on the fast track land reform. This reform has been implemented 18 years ago but with long lasting effects. The last land reform (the fast track land reform) was launched in Zimbabwe in 2000 (see the Functional Analysis) and remains a sensitive topic.

During the colonial period, numerous policies and instruments favouring white settlers contributed to the construction of a dual agricultural system: on one side, large commercial farms owned by white settlers located in areas with good agricultural potential; and, on the other side, black populations relegated to tribal trust lands (named “communal lands” today) with low agricultural potential (in particular with low rainfall, mainly in natural regions IV and V).

[49] http://www.parlzim.gov.zw/component/k2/land-commission-bill-h-b-2-2016, accessed 18th March 2018

After independence (1964), and the Lancaster House agreement (1979), a first land reform occurred which was limited in scale and had a limited effect; after it was implemented, 1% of the population (mainly white) still owned 45% of the land. A more ambitious land reform followed from 2000 to 2007 (known as the fast track land reform programme) that had a major impact: 11 million hectares of land (mainly land on 4,000 white-owned farms) were redistributed to the benefit of more than 150,000 families. The analysis of the impact of this fast track land reform is quite controversial.

On one hand, experts of Zimbabwean agriculture emphasize the positive outcomes of this reform: it put an end to the dual agriculture model and helped promote a more inclusive one. Despite a lack of financial and institutional support, new farmers have been very active and successful in producing food for their families and building new market linkages to sell their surplus (Scoones et al., 2010).

On the other hand, there have been numerous critiques of the process (violent eviction of farm owners and their farm workers, with little to no compensation; illegal multiple allocations, multi-farm ownership, unclear boundary demarcation, uncertainty about land tenure) and its consequences (dismantlement of productive infrastructure, i.e., irrigation systems; limited investment capacity of the new owners due to uncertainty over land tenure and reduced access to loans, underutilization of land held for speculative purposes, dramatic decrease in agriculture production and productivity...).

The first land reform was based on a willing buyer-willing seller arrangement. In the second land reform, no prior consent was required. Expulsions of farm owners and workers have sometimes been violent; different decision-making levels (national, provincial, local) have often interfered, leading to conflicting initiatives. The process has also been accompanied by disorganized and unauthorized land invasions (named 'Jambanja').

Farms and their infrastructure have been seized, and former farm owners have sold major portions of their cattle. The consequences for the beef value chain have been described in the functional analysis. Transparency, participation and consultation have been lacking, leading to long-term problems that remain unresolved, raising specific issues in terms of equity, compensation and justice and that we present below.

4.4.3 Equity, compensation and justice

The questions on this topic explore:

- Do the locally applied rules promote secure and equitable tenure rights or access to land and water?
- In case a disruption of livelihoods is expected, have alternative strategies been considered?
- Where expropriation is indispensable, is a system for ensuring fair and prompt compensation in place (in accordance with the national law and publically acknowledged as being fair)?
- Are there provisions foreseen to address stakeholder complaints and for arbitration of possible conflicts caused by VC investments?

To document this topic, we propose to focus on three policies who have deeply affected access to land and water for livestock owners.

Land reform

In relation to the fast track land reform, the main issue is the lack of official tenure rights for some of the beneficiaries of the reform. Many new farmers who settled on seized land do not have an official lease, and are like squatters. This lack of title deeds makes it difficult to secure bank loans (Matondi and Dekker, 2011: 22). The ZFU (Zimbabwe Farmers Union) pledges to "Make the land title documents (99 year lease, land permits) bankable and transferable and restore the land market thereby unlocking the land value and giving the value to the beneficiaries of the land reform" (ZFU, unknown).

Access to grazing areas is a major concern for farmers on communal lands. There is no evidence that land reform has helped to alleviate this constraint. Some communal farmers use to send their animals to areas which are now occupied by A1 (or A2) farms. Most A1 farmers cannot afford to fence their area in order to reduce unauthorized grazing. As a consequence, numerous conflicts between communal and A1 farms are reported and mechanisms for the arbitration of such conflicts are lacking.

Some former large-scale farm owners have kept their houses and cattle and need to rent grazing areas from the new owners in order to maintain their activities. As renting land is officially illegal, this can only be achieved through informal and insecure arrangements. One of the white farmers whom we met has arrangements with the 23 new owners of what was once his farm. Another one rents land from the new owner (who lives in Harare), he pays $1000/month for 750 ha.

The question of compensation remains unresolved 18 years after the beginning of the reform. The right to compensation for evicted farmers was confirmed by the new Constitution adopted in 2013 (land itself cannot be compensated since it belongs to the State, but the Constitution recognizes that farmers should receive compensation for the equipment, land improvement, agriculture infrastructure like dams, roads…). However, only 250 farms (out of a total of 4,000) have been compensated to date. Many farms have not yet been valuated, and funds for compensation are lacking.[50] Compensation of expulsed farm workers also has not yet been resolved.

Consequently, Zimbabwe has been criticized by the international community since most of the principles of VGGT are not implemented. International donors and financiers refuse to support projects in land reform areas (Scoones, 2018). As a result, 11 to 22% of small-scale farmers (new A1 and new small A2) are excluded from potential donor and NGO support. The new president, Emerson Mnangagwa, made a commitment to compensate evicted farmers. However, it remains unclear who will pay the several billion dollars that it is estimated to be needed for this compensation.

[50] https://theconversation.com/settling-the-land-compensation-issue-is-vital-for-zimbabwes-economy-89384, accessed the 16 of march 2018

Despite these problems, the land reform has without doubt permitted the beef value chain to be more inclusive. On the 4,000 seized farms, more than 150,000 new farms have been established, with approximately today 630,000 heads of cattle (around 12% of the national herd, see Table 3 in the functional analysis). The institutional changes have also facilitated the participation of other stakeholders in the beef chain, such as small scale abattoirs and middlemen (Scoones et al., 2010).

Park and conservancies areas

Another issue related to land tenure and water rights is linked to the presence of large conservation areas (national parks and private conservancies) in the country. Farmers with livestock living on the edge of these conservation areas have to face specific challenges.
Access to conservation areas (for grazing, hunting, collecting firewood…) is legally forbidden and herders can be fined if their animals (including stray cattle) are caught inside: the fine is $20, plus $2 per animal overnighting in the park (nonetheless, conservation areas are also a "security" for livestock since in case of severe drought, authorities may allow cattle to graze in the park).

Moreover, attacks on livestock by hyenas and lions are common, with no compensation for the owners [different projects like Campfire aim to improve the share of benefits related to these parks (tourism, trophy hunting) with local communities but with limited results].
One farmer interviewed explained the limited involvement of local farmers in the beef value chain in this way: "the cattle that we could sell are eaten by lions".

Foot and Mouth Disease zoning

Before the fast track land reform, a strategy of geographic zoning in relation to FMD control prevailed. The objective was to serve a national project targeting beef exports to European countries supplied by large-scale commercial farms. This agribusiness, export-oriented approach to beef production has had an impact on the territorial organisation and the population of the entire nation. The FMD measures clearly had a positive impact on the export-oriented livestock sector. In contrast, smallholders and poor households -- especially the communal farmers living in the buffer zones -- bore the full costs and constraints (restriction of cattle mobility, culling and quarantine in case of FMD outbreak) of the policy but benefited less from it. As Perry et al (2003) have calculated, only 16% of the benefits earned by Zimbabwe from the FMD policy actually went to low income households although they represent the majority of households.

Some current policy documents have announced an objective to restore FMD free zones through fencing and strengthened veterinarian controls (e.g., the Command Livestock Programme). This would be difficult to implement for financial reasons, but also because resettlement areas resulting from the fast track land reform now straddle the previously fenced line separating FMD free zones from the rest (our interviews).

In relation to water, access is critical for livestock and this is even more important during drought periods. Many farmers (and particularly in low rainfall areas) rely on dams, wells and boreholes for their cattle. With land reform, a lack of government resources, insecurity in land tenure and limited

access to credit, most of this infrastructure has not been maintained and needed investments have not been implemented (Institut de l'Elevage, 2013).

To conclude on lands and water rights, it is necessary to underline recent positive changes such as: the New Land Commission Bill, the recent bankability of 99-years lease and cattle for loans, the offer of 99-years lease for the remaining white farmers (instead of the five-year leases as per the previous arrangement)...But it is too early now to assess the effective impact of these measures on the beef value chain.

4.5 Gender equality

The issue explores the question of gender inclusion within the entire value chain. It aims to answer the question: is gender equality throughout the value chain acknowledged, accepted and enhanced? It covers women's inclusion in the economic activities related to the value chain; women's access to resources and services (assets, lands, credits...); women's participation in decision-making (related to work, income...); women's leadership and empowerment; and the hardship and division of labour. Table 37 sums up the main findings.

Assessment Category	Summary of Findings	Status
Economic activities	Women are much more involved in goat and chicken related activities than cattle (compared to men). Nevertheless, the development of the beef value chain may indirectly positively impact their economic activities.	Moderate/low
Access to resources and services	Women are discriminated against with regard to access to assets, including land, and financial support. This is a constraint to develop cattle related activities. It also contributes to turning rural women into a vulnerable group. Nevertheless, cattle related projects conducted by NGOs are helping to reduce the effects of this discrimination.	Moderate/low
Decision making	Women are little involved in decision making in the beef value chain except for milk and manure valorisation. When they have decision-making power over cattle related income, they use it for the direct improvement of household food security and livelihoods.	Moderate/low
Leadership and empowerment	Information available on this topic is general in nature and not specific to the beef value chain. Women's leadership and empowerment is still limited in the context of Zimbabwe. There is no element showing that the development of the beef value chain could affect, positively or negatively, this situation.	Moderate/low
Hardship and division of labour	In relation to the beef value chain, women are mainly involved at the farm level, in milking. Access to draft power is probably a concern in female-headed households. Improving this access could reduce the vulnerability of these households.	Moderate/low

TABLE 37: GENDER EQUALITY - MAIN FINDINGS AND SCORING

4.5.1 Gender equity - general background

Zimbabwe signed many conventions promoting gender equality such as the Convention of Elimination of all forms of Discrimination against Women (CEDAW), the Solemn Declaration on Gender Equality in Africa, the SADC Protocol on Gender and Development... The country also ratified the Protocol to the African Charter on Human and People's Rights and on the Rights of Women in Africa.

The new constitution adopted in 2013 promotes gender equality and women's rights, and calls for equal participation of women and men in the political, economic, cultural and social spheres. It also voids all laws, customs, traditions and cultural practices that infringe on the rights of women. The Labour Act recognises the right of women and men to equal remuneration for "work that involves similar or substantially similar skills, duties, responsibilities and conditions". A Ministry is dedicated to Women's Affairs, Gender and Community Development. Numerous policies, strategies and plans also have been set up in order to address these issues such as:

- National Gender Policy (2013 – 2017)
- Agriculture Sector Gender Strategy
- National Gender–Based Violence Strategy
- National Strategic Plan for the Education of Girls and other Vulnerable Children.

Women are also recognized in the different laws and policies as a group facing discrimination. Nevertheless, many problems remain in practice as stated by numerous reports (e.g., the Report on the implementation of the United Nations Convention on the Elimination of All Forms of Discrimination against Women (CEDAW); the Zimbabwe MDG progress report; the Women and Men in Zimbabwe, report 2016…). These problems also have been highlighted by various internationally recognized indexes (GDI, GII, SIGI…) that have been calculated in Zimbabwe in order to grasp the situation of women and gender equity in Zimbabwe.

The Gender Inequality Index (GII-UNDP) ranked Zimbabwe 126 out of 159 countries. This bad ranking is mainly related to the disproportionate share of women affected by HIV (prevalence among women is 18% whereas it is 12% among men) and victims of violence (including sexual violence).

The Social Institution and Gender Index (SIGI, OECD)[51] assesses at the national level the formal and informal laws, attitudes and practices that restrict women's and girls' access to rights, justice and empowerment opportunities. It examines discrimination against the family code, violence against women, son bias (missing women and fertility preference), restricted access to resources and assets, and civil liberty. For Zimbabwe, it points out as the main source of social inequality the family code (including age of marriage, parental authorities and inheritance rights for daughters and widows), and access to resources and assets (including access to land, non-land assets and financial services) (see Figure 35).

[51] https://www.genderindex.org/country/zimbabwe/, accessed 16th March 2018

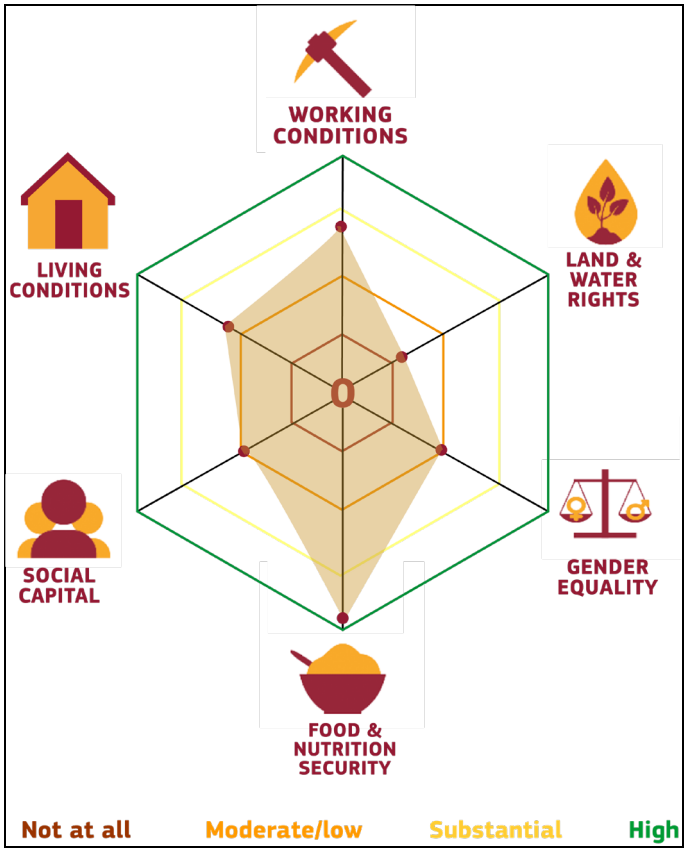


FIGURE 35: THE SOCIAL INSTITUTION AND GENDER INDEX (SIGI)
Source: OECD, 2014
Nb: 0 represents low discrimination and 1 represents a high level of discrimination

A report (Rep. of Zimbabwe, 2009) on the implementation in Zimbabwe of the United Nations Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) identifies women in rural areas (about 65% of women live in rural areas) as being particularly vulnerable in relation to discriminatory traditional practices (inheritance, minimum age for marriage). Moreover, women engaged in agricultural activities are particularly discriminated against when it comes to access to land reform, inheritance of farms and agricultural assets, access to communal area and financial services. We will develop these points in relation to the beef value chain and cattle related activities.

4.5.2 Economic activities

This section examines two mains questions:

- Are risks of women and vulnerable groups being excluded from certain segments of the value chain minimised?
- To what extent are women active in the value chain?

Women are highly involved in agricultural activities, more than men [in 2014, 54% of those above the age of 15 working in the agriculture sector (formal and informal, paid employment and self-employment) are female; and 71% of the female population work in agriculture compared to 'only' 67% of the male population (Zimstat, 2015a: 71), 43% of agricultural households are headed by women]. This is partly linked to male migration in neighbouring countries and widowhood (see Table

38 below). The rate of poverty is higher among these households: 72% for women-headed households, 58% for man-headed households (Rep. of Zimbabwe, 2009).

In Zimbabwe, 20 to 25% of farm workers are women, with the largest proportion in the horticultural sector (ZCTU quoted by ILO, 2009). However, they represent 60% of the category of "unpaid contributing family workers" (ZimStat, 2015a: 99). In the beef value chain (Table 38), women are under-represented (compared to their involvement in the agriculture sector). Traditionally, cattle represent the capital and the wealth of a family and are associated with its head, the man. Women are more generally involved in activities contributing directly to household food supply, e.g., goat and chicken husbandry.

During one focus group discussion conducted with women living in a communal area (Chiredzi), we tested the hypothesis that developing cattle (as a male activity) on a farm could generate competition with animals raised by women (e.g., goats) over access to inputs such as grazing areas, crops residues, family work... However, the participants did not validate this hypothesis. Moreover, the results of one project[52] (implemented in Zimbabwe to address market blockages and constraints to cattle productivity and marketing) show that small livestock (goats and chickens) producers have also benefited from the improvement achieved in the cattle production and market chain (Mogova and Barker, 2008).

'Lobola' is a way for mature women to obtain cattle. However, it is also unequally shared between the parents of the bride since the groom usually gives one head of cattle to the mother and 4 to 5 to the father (our interview).

Activities, sectors	% of women in the total (women/men and women)
Agriculture labour force	60
Head of households	43
A1 beneficiaries	18
A2 beneficiaries	12
Cattle owner (card holder)*	less than 25
Pen fattening group members*	40
Dip tank committee members*	less than 10
Vet services, Animal health workers*	30
Abattoirs workers*	4 (cleaning, laundry, canteen, accountability)
Input sector*	Secretariat, Accountability

TABLE 38: SHARE OF WOMEN IN AGRICULTURE AND IN BEEF VALUE CHAIN
Source: Zimstat and our interviews (*)

Women's involvement in the beef value chain is limited and focused at the farm level. However, women are indirectly involved in activities related to cattle through manure collection for horticultural activities. Moreover, men and women (including female children) are involved in milking animals (cows and goats). When production exceeds family needs, women sell the surplus and mainly use it for purchasing food for the household (see below "decision making").

[52] Project "Improving livelihoods of marginalised small livestock farmers in Guruve district (Mashonaland central province)", implemented by CIDAL PDF, Practical action.

Moreover, NGOs are keen to actively involve women in their projects; in beef pen fattening projects, women are consequently "over represented" (around 40 to 50% of the members of the different projects that we visited or read about were women).

At other stages of the chain, women are little involved: work in the feed sector and in abattoirs involves carrying heavy loads. While they are not numerous, they are nevertheless present to assume secretary tasks, canteen, laundry and cleaning services.

Taking into account the numerous functions related to cattle, we may consider that improving women's access to cattle activities could be a way to decrease their vulnerability. However, goats may be another option which would deserve investigation.

4.5.3 Access to resources and services

This section examines four mains questions:

- Do women have ownership of assets (other than land)?
- Are women's land rights equal to those of men?
- Do women have access to credit?
- Do women have access to other services? (extension services, inputs)?

All statistical data available show that women have limited access to productive assets (ALS, 2015; EU, FAO, 2014).

Livestock (and above all cattle) are not considered as an income source but rather as a fixed asset (cattle are mainly sold in case of shock/stress or when old to recover a residual value). Women own a smaller number of livestock than men (and these are mainly small ruminants and chicken as mentioned above); for example in Nkayi, women possess half as many cattle as men (1.6 heads of cattle/ women) (EU, FAO, 2014). Women also possess less ploughs and carts than men (see Figure 36).

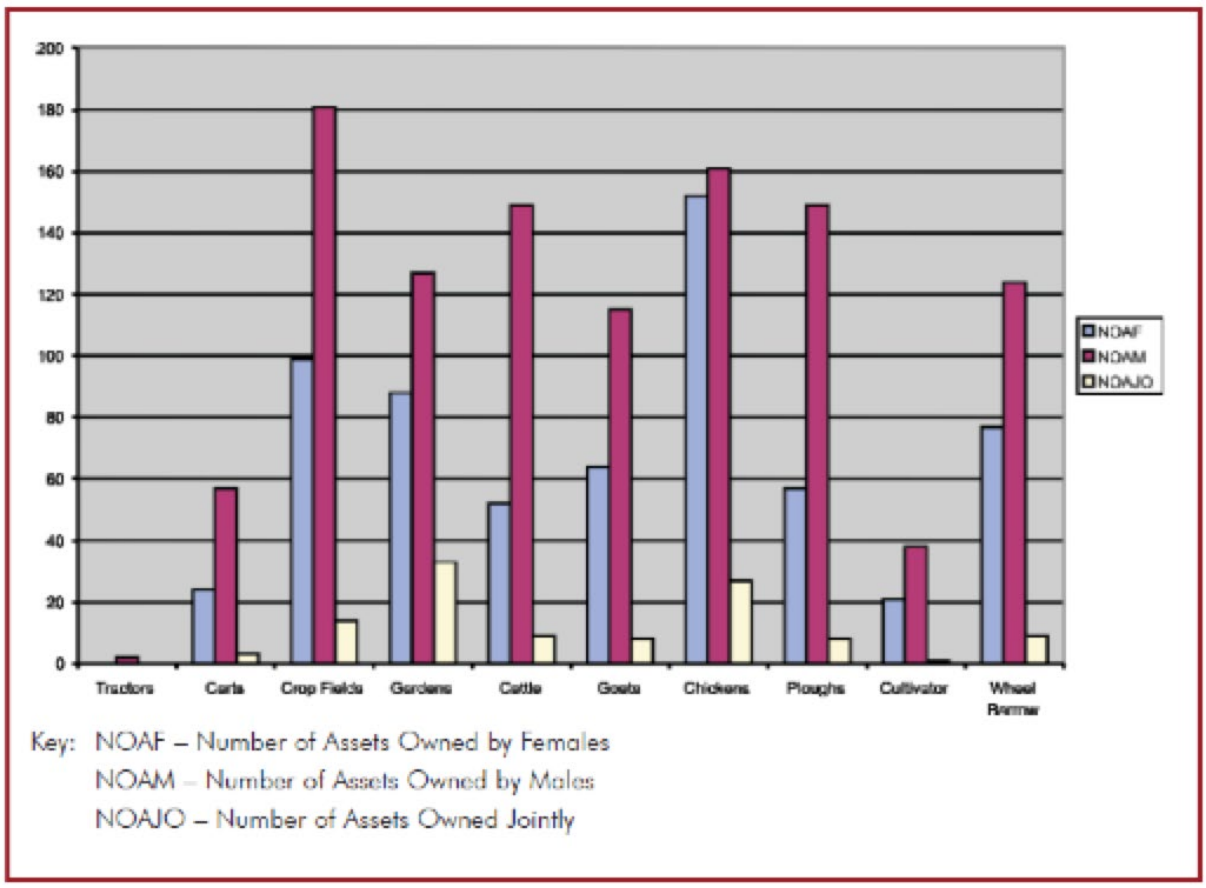


FIGURE 36: OWNERSHIP OF ASSETS BY GENDER
Source: Zimbabwe MDG Progress Report (2004) and Rep. of Zimbabwe (2009:45)

The gap between men and women's access to assets is even greater if we consider access to land. As mentioned above, 43% of agricultural households are headed by women. Nevertheless, only 20% of women involved in agriculture are official landowners or leaseholders. They also have less land than men: in communal lands, households headed by women have only 1.86 ha on average, whereas households headed by men have an average of 2.73 ha (WFP, 2017).

Traditionally, access to land is more difficult for women than for men and inheritance practices tend to discriminate against widows and daughters. Women have access to land informally through their husbands and are not protected when the husband dies, the farms tending to be taken over by the sons (Matondi and Dekker, 2011). Moreover, divorced women have few rights over family assets.

Despite the intention of the land reform to give equal opportunities to all gender groups, women have benefited little from it (Matondi and Dekker, 2011). According to a report from the Zimbabwe Agriculture Investment Program (ZAIP, 2017: 17), women represent 18% of the beneficiaries of the land allocations in the A1 resettlements, and 12% in the A2 resettlements (Table 38).

Access to credit is an even more discriminatory. Many sources report limited access to credit for women in all activity sectors. Even in a sector like agriculture where women dominate, women receive less financial support than men (CEDAW report, ALS 2015). This is partly a consequence of women's limited access to land. Indeed, title deeds are necessary to secure bank loans. While 46%

of women are heads of households, only 20% are official land owners. As mentioned above, in land reform areas, the lack of title deeds is even more widespread.
Livestock ownership, mainly cattle, is a way to save and manage the absence of access to credit (see the functional analysis). Recently, the Government has required banks to accept cattle to secure bank loans. However, as women's involvement in cattle activities is limited, this is unlikely to be of much benefit to women.

However, women can access a kind of "lending and saving scheme" organized by women at community levels known as *isal.* In one of the groups visited (15 to 20 members), each member is free to save from $10 to $50 per month. A member can apply for a loan (members can ask for $100 and above, a maximum of 4 times a year) at a 10% monthly interest rate. The interest is shared by the members of the group. A member can interrupt their repayments when necessary (but has to continue paying the interest), which is seen as a major advantage of this system. These loans are generally used by women to pay school fees, or to buy food, seeds or animals.

At the moment, pen-fattening activities are mostly developed through NGO projects or through contracts with abattoirs. Most of the time, these activities require access to credit (to buy cattle and stock feed, build a kraal, secure access to water, and eventually pay for a herder). NGOs and abattoirs can facilitate credit access: they guarantee to the bank the technical viability of the project. That benefits all members of the project, including women.
With regard to access to extension services, it is noticeable that extension in livestock is mainly in the hands of veterinary services (this brings a strong "vet health bias" as mentioned earlier). Veterinary services focus on cattle (3/4 to 4/5 of the human and financial resources of the veterinary services are dedicated to cattle, according to our interview in Chiredzi). This benefits the beef value chain, but excludes women from the support of veterinary services since they mainly possess goats and chickens.

4.5.4 Decision making

This section examines five main questions:

- To what extent do women take part in the decisions related to production?
- To what extent are women autonomous in the organisation of their work?
- Do women have control over income?
- Do women earn independent income?
- Do women take part in decisions on the purchase, sale or transfer of assets?

According to Zimbabwe socio-cultural norms, men assume leadership and decision-making roles in households and communities. Key findings of the Zimbabwe demographic and health survey (2012) confirm this leadership (see Box 5). This also applies to decisions related to livestock (Rep. of Zimbabwe, 2014: 31), as confirmed by the baseline survey conducted in the framework of FAO/EU livestock project (EU, FAO, 2014): in half of the sample surveyed, men have full control over income from selling cattle; in the other half, couples make joint decisions.

However, when it comes to income from the sale of chicken and garden products, women have full control. For income from milk (goat milk and cow milk), the situation is less clear. But in all cases,

when women have control over this income, they use it to purchase food for the family. As mentioned by one of the women in our focus group discussions, "if left alone, men would spend most of the income at the beer hall; hence they (women) use this income for the benefit of all the family". Another source, based on the result of a small livestock project (Mugova and Barker, 2008), showed that women (30% of the beneficiary farmers were women) use the increased incomes earned to pay school fees and buy food and clothing for their families. Small livestock (goats and chickens) producers also have benefited from the expanding market of inputs and advice from paravets brought about by the project.

Key Findings

- Almost one-third of currently married women who receive cash earnings report deciding themselves how their own earnings will be used; 62 percent say they decide on use of earnings with their husband.
- The majority of women report that they do not own a house (63 percent) or land (64 percent). Twenty-seven percent of women say that they own a house jointly with someone else; similarly, 25 percent of women report that they own land jointly. Overall, 9 percent of women own their own house, and 9 percent own their own land.
- The majority of currently married women (60 to 69 percent) report that each of three household decisions is made jointly with their husbands. About 24 percent of women report that they alone made decisions about their own health care; 20 percent make decisions to visit their families and relatives, and 19 percent make decisions about major household purchases.
- Forty percent of women believe that a husband is justified in beating his wife for at least one of five specified reasons (if she burns the food, if she goes out without telling him, if she neglects the children, if she argues with him, or if she refuses to have sexual intercourse with him). Only 34% of men believe that a husband is justified in beating his wife for at least on of these same five specified reasons.

BOX 5: WOMEN'S EMPOWERMENT AND DEMOGRAPHIC AND HEALTH OUTCOMES, KEY FINDINGS.
Source: Zimbabwe demographic and health survey (Zimstat, 2012: 231).

4.5.5 Leadership and empowerment

This section examines four main questions:

- Are women members of groups, trade unions, farmers' organisations?
- Do women have leadership positions within the organisations they are part of?
- Do women have the power to influence services, local government and policy decision-making?
- Do women speak in public?

Information available on this topic is general and not specific to the beef value chain in particular. Women's leadership and empowerment are still limited in Zimbabwe. There is no element showing that the development of the beef value chain could affect, positively or negatively, this situation. According to the Zimbabwe Millennium Development Goals (MDG) progress report, "Zimbabwe has achieved gender parity at primary and secondary school levels, but the proportion of women in decision-making positions is still very low" (UNDP, 2012).

Few women hold the title of "traditional chief". However, in 2013 there were six female traditional chiefs [thus supporting the view, according to Manyena (2014) that culture and tradition are dynamic in Zimbabwe]. In the working world, 61% of women are engaged in the workforce (all sectors) but only 15% of senior and management positions are filled by women.

In the Zimbabwean political sphere 35% of parliamentary seats are held by women. In local government decision-making bodies, only 19% of members are female (UNDP, 2012). In rural district councils, there are even fewer women (see Figure 37 below).

At the community level, women are mainly represented in local institutions in charge of children's education and nutrition (e.g., school development committees), or health (e.g., at the rural community health centres). Very few women (less than 10%) are on livestock development committees (also named "dip tank committees"). The ones present are generally in charge of the treasury since they are perceived as being more reliable (our interviews).

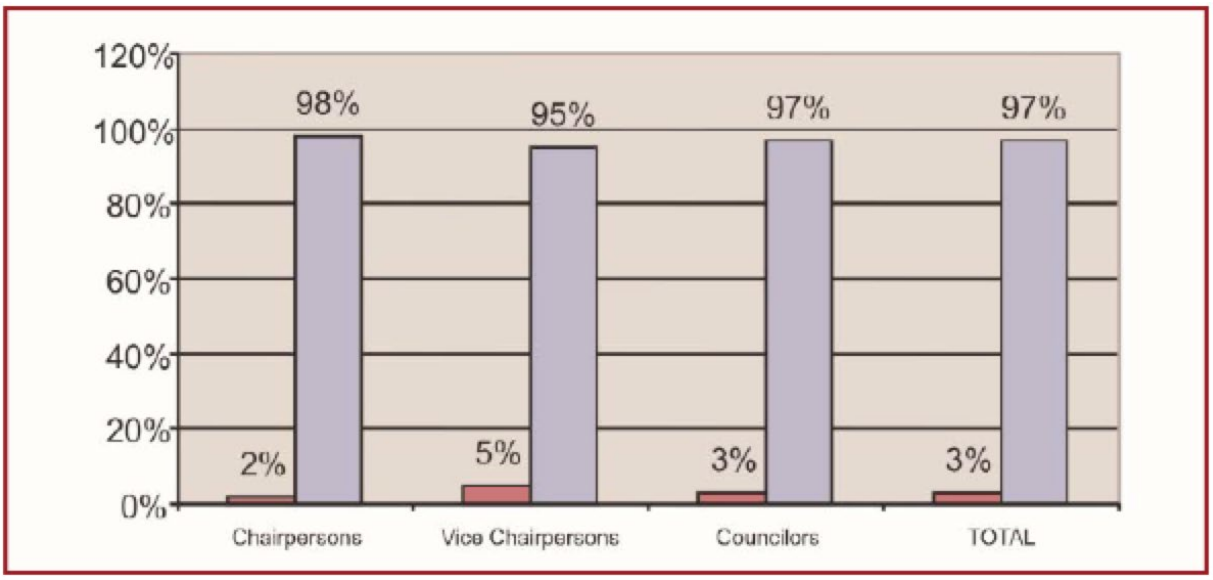


FIGURE 37: WOMEN IN RURAL DISTRICT COUNCILS
Source: Rep. of Zimbabwe, 2009:24

4.5.6 Hardship /Gender roles and division of labour

This section examines two main questions:

- To what extent are the overall work loads of men and women equal (including domestic work and childcare)?
- Are labour saving technologies utilised by women in their agricultural and domestic work?

When it comes to the division of labour in family farming systems, women are mainly in charge of domestic work and childcare. However, they also contribute with men to farming activities, mainly in crop production (see Figure 38 below; EU, FAO, 2014).

The main problem in relation to this topic may be access to cattle as draft power (it can be considered as a labour saving technology) in women-headed households. The share of female-headed households without draft power is not documented. However, as cattle ownership by women is limited, (see above), this share may but higher that for male-headed households, contributing in this way to a higher vulnerability of these households.

Household Activities	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Women's Jobs												
Cooking												
Taking care of children												
Fetching water												
Washing												
Cleaning												
Threshing and pounding												
Men's Jobs												
Land clearing												
Construction work												
Herding and milking animals												
Fencing												
Manure digging												
Digging wells and pits												
Jobs Performed by both Men and Women												
Ploughing												
Weeding												
Harvesting												
Vegetable gardening												
Thatching												
Tree cutting and firewood collection												
Brick moulding												

FIGURE 38: GENDER BASED ACTIVITY CALENDAR
Source: (EU, FAO, 2014)

Other surveys (FAO and EU, 2015) show a greater involvement of women in cattle related activities: they are responsible for making dairy products, and also collaborate on economic activities such as selling and purchasing cattle, eventually selling dairy products and taking care of animal health. Our focus group discussions also confirmed women's involvement (child and adult) in milking (cows and goats).

4.6 Food and nutrition security

This section examines the four pillars of food security: (1) availability of food, (2) access to food, (3) use of food and (4) stability. Table 39 sums up the main findings.

Assessment Category	Summary of Findings	Status
Availability	At the farm level, cattle are an asset rather than a direct source of food. At the national level, the beef value chain contributes to the domestic market and to increasing national food availability.	Substantial
Accessibility	Cattle ownership is essential to secure food access on small scale farms. It is positively correlated to the production and yield of staple food. It brings additional income.	Substantial
Utilization and nutritional adequacy	In a context of very low dietary diversity and nutrient deficiency, cattle products (meat, milk) are essential to improve the nutritional status of the population.	Substantial
Stability	Cattle ownership contributes to household resilience in case of a shock or crisis (climatic, financial...).	Substantial

TABLE 39: FOOD AND NUTRITION - MAIN FINDINGS AND SCORING

Different studies, using different indicators, describe Zimbabwe as a country with low food and nutritional security:

- Zimbabwe Vulnerability Assessment (ZIMVAC), 2016
- National nutrition survey, 2010
- Zimbabwe MDG progress report, 2012
- Poverty, income, consumption and expenditure survey (PICES), 2011
- Baseline studies for different projects (FAO/EU livestock project; Amalima, Ensure...)

For example, the baseline survey conducted in the framework of the Amalima and Ensure projects shows that 28% of households suffer from moderate or severe hunger and about 4% experience severe hunger (ICF International, 2015). In terms of food security, this situation can become even worse during the lean season (Jan-March) and during drought periods (e.g., 2015-2016), (Figure 39).

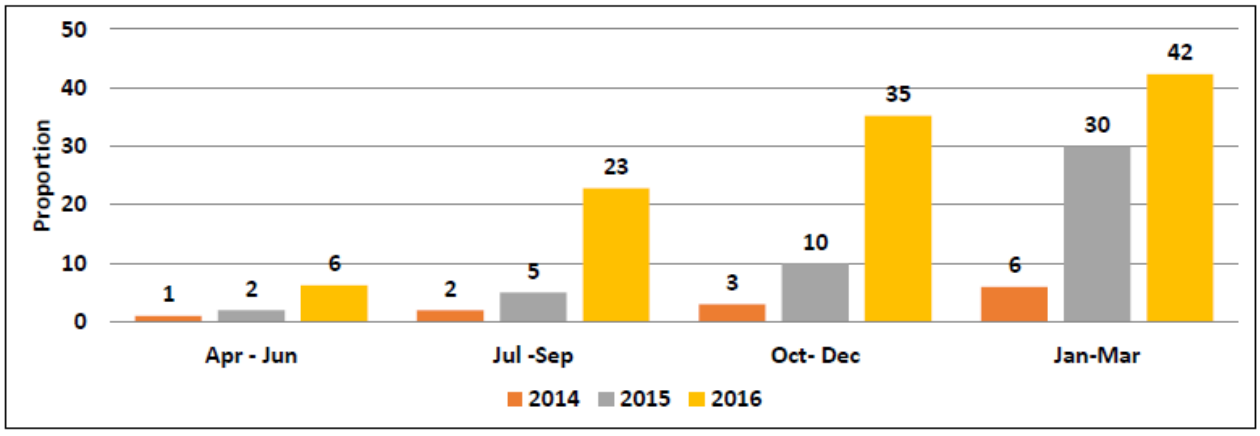


FIGURE 39: TRENDS IN FOOD SECURITY BY QUARTER
Source: Food and Nutrition Council and SIRDC, (2016)

Nevertheless, this situation should be qualified in light of the coping mechanisms implemented at the farm level, many of them including cattle (Scoones, 2018). It is important that the development of the beef value chain does not compromise the contribution of cattle to these coping mechanisms.

4.6.1 Availability of food

This section examines two mains questions:

- Does the local production of food increase?
- Are food supplies increasing on local markets?

At the farm level, cattle do not contribute directly to household consumption except for milk during the rainy season. Livestock is consumed on special occasions, like weddings or other ceremonies usually celebrated with the killing of a goat or a cow. Most communal farmers view their livestock as an asset rather than as a food source (ICF International, 2015). Meat availability at the farm level is more dependent on home-raised chickens and goats. Most farmers, even cattle owners, buy the beef meat that they consume.

At the national level, the beef value chain focused in the past on the export market. Nowadays, exports have stopped and the beef chain supplies the domestic market. This market is segmented. We have identified 3 types of consumers:

- Low income consumers consume small quantities of animal products, mainly offal (since it is cheap, $3/kg)
- Middle income consumers buy a mix of beef meat ($4.5/kg) and offal. These consumers value fat meat.
- High income consumers ("the ones of Borrowdale") consume lean meat (up to $8/kg)

As a consequence, in a production area like Chiredzi district (Masvingo Province), with a majority of low income consumers, cattle and beef production contributes to the local availability of low quality products: local consumers mainly consume offal (60% of the offal of the animals slaughtered in medium to large scale local abattoirs are consumed locally, but only 20% of the carcass; the rest is sent to the main urban areas of the country). Beef meat consumption is mainly based on small cattle (low grade), sold directly by farmers to local butchers. Sick animals, and even sometimes dead ones, enter the food chain for local consumption. As another example, in Matabeleland North, 10% of the meat production is consumed in the province (our interview).

In other points of the beef chain, the situation is not well documented. At slaughterhouses, workers are forbidden to bring food inside for safety reasons. They benefit from a canteen where they receive a meal as part of their income. This meal includes meat every day (according to our survey).

4.6.2 Accessibility of food

This section examines two mains questions:

- Do people have more income to allocate to food?
- Are (relative) consumer food prices decreasing?

While cattle ownership does not contribute directly to household consumption, it nevertheless does make an important contribution to food accessibility. According to different experts, using cattle for field crops rather than for beef business is safer for food security and probably more profitable (van Eckert, 1989).

On small-scale farms, cattle are viewed as productive assets that directly contribute to increasing farm production. Indeed, a study showed that holding cattle and maize output and yield are highly correlated through the provision of draft power and manure (Scoones, 2010).

The availability of draft power increases labour productivity and the cultivated surface area; it also improves the timeliness of key farming operations which is essential in drylands (but drought events can dramatically reduce this draft power): "Timeliness is almost as important as access. Late ploughing when you are way down the queue or when hiring proves impossible is almost as problematic as no ploughing, given the need in such dryland areas to be highly responsive… Cattle in particular (but also donkeys) for draught power are thus critical to the farming system and to livelihood survival" (Mavedzenge and al., 2006).

A 1985 survey (Shumba, 1985; quoted by van Eckert, 1989) showed that farmers who own cattle have more arable land and achieve higher yields than non-owners. Such quantitative data should be updated, but seems still to be relevant since tractor ownership is still limited.

When it comes to other segments of the beef chain, it is useful to emphasize that the minimum wage in agriculture puts the worker under the food poverty line (see the section on working conditions). Workers in large-scale abattoirs benefit from higher wages but also from a canteen with free meals with meat. When there is no canteen, they can have access to meat at a low price (for example, offal at $2/kg - instead of $3.5/kg on the market - in one abattoir visited).

4.6.3 Utilisation and nutritional adequacy

This section examines three main questions:

- Is the nutritional quality of available food improving?
- Are nutritional practices being improved?
- Is dietary diversity increasing?

Meat consumption is very low in Zimbabwe compared to the world average (34.3 kg/cap/year, OECD, 2017): 6 kg of beef meat and offal according to our own assessment, see above, and 11.5 kg of other meat according to the Zimbabwe Association of Abattoirs (2017).

During one of our focus group discussions in a Chiredzi rural area, people interviewed declared that from their point of view, they consume much less meat than their parents did since their families had larger herds (since grazing areas were more available, and drought periods less intense), and wild meat was abundant.

The dominant maize-based diet leads to poor dietary diversity (Figure 40). Daily meals (according to a survey conducted in communal farms) are mainly based on home or local products: “Breakfast comprises tea, porridge, “samp” or home baked bread (“chimodo”). When available, green maize, pumpkins, squash and sweet potatoes are eaten at breakfast time, or in-between main meals as snacks. In most wards, lunch and supper consists of “isitshwala” (sadza), consumed predominantly with green leafy vegetables and at times milk, beans or poultry, depending on access. The main animal sources of food are chicken and goat meat and cow’s milk (in the rainy season). In the past

24 hours, around 22.7% of the surveyed households had consumed meat (21% for milk)" (EU, FAO, 2014: 7).

The consumption of food rich in protein (such as meat, milk and eggs) is low, and micronutrient deficiencies are important among children under 5 and pregnant women (Zimstat, 2015a). One cow in a household contributes to increasing the diet diversity score and to micronutrient supply (a cow produces 1 l to 3.5 l/day, mainly used for home-consumption (EU, FAO, 2014).

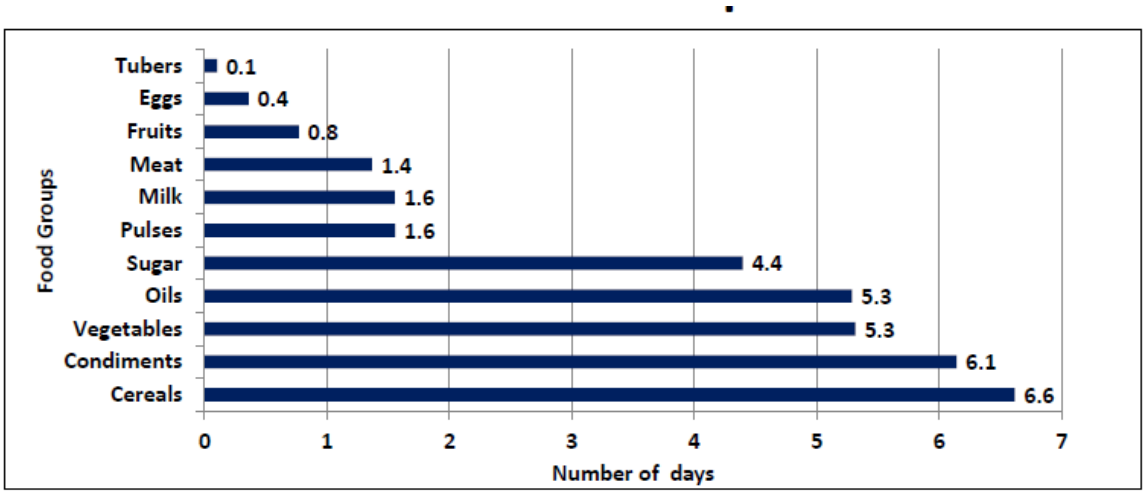


FIGURE 40: AVERAGE NUMBER OF DAYS HOUSEHOLDS CONSUMED FOOD FROM VARIOUS FOOD GROUPS PER WEEK
Source: Food and Nutrition Council and SIRDC, (2016)

According to WFP (United Nations World Food Programme, 2014), stunting may not necessarily be related to food quantity but rather dietary diversity and other health related factors. In contrast, high food insecurity levels are linked to critical events. Improving cattle ownership and cattle product consumption thus could contribute to reducing both stunting and food insecurity.

With regard to food safety, the visit to the hospital in Chiredzi did not reveal major problems, except for sporadic outbreaks of anthrax. Anthrax is a zoonotic disease and people get sick by consuming infected cattle (or hippo). In 1979-1980 a large outbreak affected 10,000 people following unprecedented outbreaks in cattle, and 182 people died (Chikerema et al., 2012). Since then, outbreaks have been sporadic. Brucellosis and bovine tuberculosis are other zoonotic diseases associated with cattle that might affect consumers or farm workers (dairy farm workers in the case of brucellosis) but epidemiological data are lacking.

4.6.4 Stability

This section examines two main questions:

- Is the risk of periodic food shortages for households reduced?
- Is excessive food price variation reduced?

Cattle ownership is essential to reduce farm vulnerability to climatic and financial risks. It is essential for the food resilience of rural households.

Cattle ownership is a safety net that permits households to face hard times: for example, in periods of drought (1982-1984, 1991-1992, 2013, 2016) or floods (2017), when farm production is reduced, livestock can be sold to buy grain. Goats are sold first, then women's cattle and finally men's cattle (our interviews).

During the last drought (2016), 7,000 cattle were recorded to have died. Farmers were encouraged to destock and to buy supplementary feed to save breeding stock (Scoones, 2018: 164). However, destocking may also be a risky option as "terms of sale during drought and repurchase following drought are not favourable to the herd owner. The cost of not having animals available in the rainy season (assuming rains come) is so high that most farmers retain their stock as long as possible" (Scoones, 2018: 166).

Cattle mobility is also essential to face drought periods and often involves illegal movements and unauthorized grazing (on commercial farms, or in conservation areas). According to Scoones (2018), during the drought in 2016, many cattle were moved from communal areas to resettlement areas where population density is lowest.

Moreover, cattle ownership has been essential to secure the purchasing power of rural households during the high inflation period (after 2000, Zimbabwe suffered a period of hyper-inflation, with a peak in 2008 with inflation estimated at several billion percent). Since 2013, Zimbabwe has been in a deflationary environment (year-on-year inflation was -1.64% in April 2016) and, as mentioned above, the economy is currently facing cash shortages that are in part a result of increased imports and decreased export earnings (Food and Nutrition Council and SIRDC, 2016). For farmers, animal ownership proves to be a safer reserve of cash than a bank account.

In relation to price volatility and variation, the price paid to farmers varies a lot according to the carcass grade (see Figure 41). It also varies according to the seasonality of demand (high demand at Christmas) and specific events (e.g., end 2017, demand for beef benefited from a ban on importing poultry from South Africa due to an avian influenza outbreak). It also varies with supply (drought period, period to pay school fees…). However, the very high variation is also due to the market opportunities accessible to farmers (as mentioned, the price paid for the same animals can vary from $500 to $800 according to the channel through which they are sold). Investing in beef offers opportunities but also risks for those with low bargaining power.

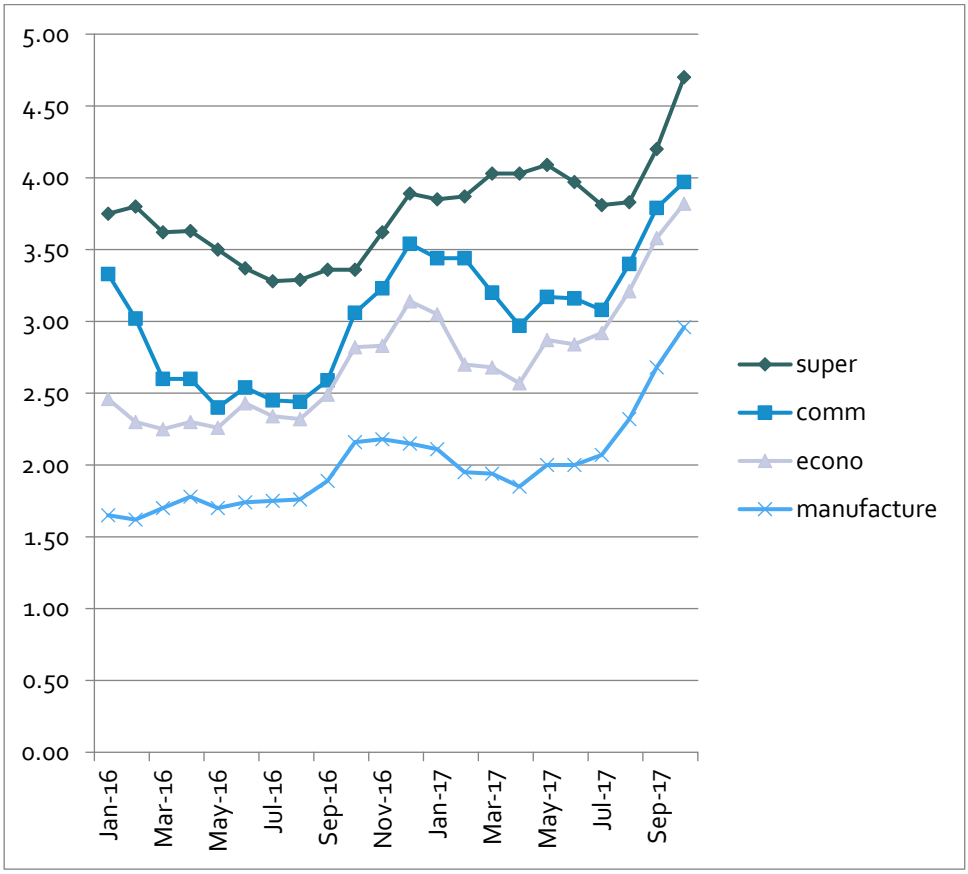


FIGURE 41: TRENDS IN PRICE PAID BY ONE ABATTOIR IN CHIREDZI DISTRICT (Z$/CARCASS) BY GRADE (APRIL 2016 - OCT 2017)
Source: Interviews

4.7 Social capital

Social capital is explored in relation to the: 1) strength of producer organisations, 2) access to information and the quality of the relations between stakeholders of the value chain, and 3) social involvement and the consideration of local knowledge and resources in the decisions that may affect the livelihood of the stakeholders involved in the value chain. Table 40 sums up the main findings.

Assessment Category	Summary of Findings	Status
Strength of producer organisations	The services offered by farmers' unions to their members seem to be limited. Their functions also overlap with those of commodities associations. The beef value chain is mainly represented by the Zimbabwe Association of Abattoirs; this indicates the weight of abattoirs in the beef value chain.	Moderate
Information and confidence	Farmers lack information, mainly on market prices. This lack of trustworthy relations reflects many of the difficulties in the functioning of the beef chains as well as the low bargaining power of small producers.	Moderate
Social involvement	Social involvement in relation to the beef value chain is based at the farm level on livestock development committees, which also play a role in supervising farmers' activities. Other organisations, more community-based, contribute to supporting farmers' access to draft power and credit.	Moderate

TABLE 40: SOCIAL CAPITAL - MAIN FINDINGS AND SCORING

4.7.1 Strength of producer organisations

This section examines 4 main questions:

- Do formal and informal farmer organizations/cooperatives participate in the value chain?
- How inclusive is group/cooperative membership?
- Do groups have representative and accountable leadership?
- Are farmer groups, cooperatives and associations able to negotiate in input or output markets?

As mentioned in the functional analysis, there are four registered farmers' unions that represent different segments of the farmer population:

- Zimbabwe Farmers' Union (ZFU) mainly represents small-scale farmers (communal and A1 farms). It is the largest union, gathering 250,000 (our interview) to one million farming households (ZFU website).
- Zimbabwe National Farmers' Union (ZNFU) was launched in 2007 to defend the interests of newly-resettled farmers. Today, however, they claim to represent all types of farmers. According to the President, this Union would gather to 250,000 members but only 32,000 of them would be active members (our interview).
- Zimbabwe Commercial Farmers' Union (ZCFU) was known in the past as the "Indigenous Commercial Farmer Union". It mainly represents black commercial farmers.
- Commercial Farmers' Union (CFU), known in the past as the Rhodesian National Farmers' Union, has been a powerful union and a fierce critic of the land reform. It has today 200-300 members, mainly white farmers, who have adapted to the dismantlement of their large commercial farms by land redistribution.

Acronym	Full name	Main type of members	Number of members	Remarks
ZFU	The Zimbabwe Farmers' Union	small scale farmers (communal and A1 farms).	250,000 to 1 million.	The largest Zimbabwean farmers' union
ZNFU	The Zimbabwe National Farmers' Union	newly-resettled farmers	250,000 (32,000 active members)	
ZCFU	The Zimbabwe Commercial Farmers' Union	black commercial farmers	?	Past name: Indigenous Commercial Farmer Union
CFU	The Commercial Farmers' Union	white commercial farmers	200-300	Past name: Rhodesian National Farmers' Union

TABLE 41: ZIMBABWE OFFICIAL FARMERS UNIONS
Sources: Unions' website and our interviews

In September 2017, ZNFU, ZCFU, and CFU merged into a Federation of Farmers Unions (FOFU). The Zimbabwe Farmers Union has not (yet) joined this federation.

Farmers have to pay an annual subscription for union membership: $2 for communal farmers, $5 for small scale farms, $10 for large scale farms. One farmer interviewed mentioned that membership was compulsory and useless. The services offered by these unions to their members seem to be limited since these unions are little represented at local levels. Interference from the ruling party is important in some of these unions.

A trade union like ZFU expressed its satisfaction regarding its ability to influence national policy (our interview). ZFU organizes "Policy dialogue sessions", [like the "Land Tenure Policy Dialogue" held in September 2017, gathering 228 farmers' representatives and representatives of the Land Commission, Ministry of Lands and Resettlement, Banker's Association of Zimbabwe…]. ZFU also edits position papers dealing with issues such as 1) Land reform 2) Access to credit by farmers, 3) Livestock. The paper on livestock highlights the need to adapt carcass grading, alleviate levies and cost of compliance regulations, renegotiate with abattoirs the share of the fifth quarter, adapt legislation on stray animals, facilitate cattle movement… This paper reflects the views of most of the communal farmers that we met.

The functions of the farmers unions partly overlap with those of the commodities associations. In the livestock sector, these associations are under the umbrella of the Zimbabwe Livestock and Meat Advisory Council (LMAC); this council includes associations of dairy, pig, and poultry producers… but no association for beef farmers. The beef value chain is mainly represented by the Zimbabwe Association of Abattoirs; this indicates the weight of abattoirs in the beef value chain.

The functioning of the beef value chain is also potentially impacted by the farm workers unions (see Box 6) and other workers unions. These unions participate in the Employment Council (EC) in the negotiations for minimum wages and recently, in October 2017, in negotiating the definition of "permanent farm worker" status (The Sunday Mail, 1st October 2017),[53] (see also the "Working conditions" section).

[53] http://www.sundaymail.co.zw/farm-workers-in-jeopardy/

The relationships between the Government and workers' unions are strained, the Government considering that these unions exceed their role when expressing themselves on social and economic issues (ILO commission 2009 and our interviews).

The farm workers unions gather farm workers employed in A2 and large commercial farms, including livestock farms. Their members are workers with official contracts, they represent a very low share of the population of farm workers. It is estimated that there are currently 3–4 million farm workers in Zimbabwe (out of an active population of 6.2 million) but only 150,000 are formally employed (Zimstat, 2015a).

The main farm workers union is the General Agriculture and Plantation Workers Union of Zimbabwe (GAPWUZ), a ZCTU (Zimbabwe Congress of Trade Unions) affiliate. GAPWUZ was created in 1982. Before the fast track land reform, this union had over 150,000 members (workers in commercial farms). However, as a consequence of the land reform, the number of farm workers dropped dramatically (from 500,000 to 150,000 workers) and so did the membership of GAPWUZ. It reached a minimum of 12,000 and is 29,000 in 2018 (our interview). GAPWUZ has been involved in defending farm workers during the land reform, as victims of expulsion (see the section Working conditions).

The Horticulture and General Agricultural and Plantation Workers' Union of Zimbabwe (HGAPWUZ) was created in 2000 during the land reform under the initiative of the government as an alternative to GAPWUZ.

There is also the Progressive Agriculture and Allied Industries Workers Union of Zimbabwe (PAAIWUZ). The number of members is unknown. It regularly denounces the strong influence of the political lobby of commercial farmers, in particular when it comes to negotiating the minimum wages of farm workers.

In the agricultural sector, there are also sector-specific unions such as the Kapenta association, gathering workers in the fish sector.

BOX 6: FARM WORKERS' UNIONS

4.7.2 Information and confidence

This section examines 2 main questions:

- Do farmers in the value chain have access to information on agricultural practices, agricultural policies and market prices?
- To what extent are the relationships between value chain actors perceived to be trustworthy?

Farmers' access to technical information is limited in general by the low number of rural extension workers. Moreover, exposure to mass media in rural areas is low [67% of rural women and 45% of rural men report having no exposure to any form of mass media at least once a week, compared with 21% of urban women and 13% of urban men, (ZimStat, 2012)]. Nevertheless, in the cattle sector, dip tank sessions are an occasion to obtain and exchange information, but with a strong focus on information on health issues compared to other cattle related issues.

Some farmers raised the question of the lack of market information (in particular information on prices) during one of the focus groups. This is a crucial question. When middlemen come into an area to buy cattle, it is difficult for farmers to bargain without knowledge of the current price paid by the abattoir. Yet the local veterinarian has this information, which he receives directly on his mobile phone from the local large scale abattoir. This information could easily be given to farmers, for example, at the dip tanks sessions.

The relationships between the stakeholders of the beef value chain cannot be considered as trustworthy. The main problems raised by the persons interviewed are:

- As mentioned above, farmers have trustworthy relations with the local butchers but feel cheated by middlemen (on price), slaughterhouses (grading systems, no payment of the fifth quarter), authorities (corruption and high levies).
- Farmers selling their animals directly to abattoirs complain of unfair transactions: the grading system is not adapted to local breeds and, moreover, the grading process lacks transparency. Indeed, farmers usually do not know the price that they will receive for their animal before it is slaughtered since it depends on the carcass grading. This grading is done by the meat inspector inside the abattoir, in the absence of the farmer for reasons of hygiene.
- Farmers are not compensated by park and wildlife management authorities (PWLMA) in particular when animals are killed by predators.
- Tension exists between farmers over access to grazing areas (between communal areas and A1 farm areas).
- Abattoirs also complain that farmers do not necessary respect contractual arrangements for out-growers schemes.
- Rural district councils feel cheated by slaughterhouses: the latter bypass public auctions to purchase cattle and do not pay the taxes due on transactions (ZimRA).

This lack of trustworthy relations reflects many of the difficulties in the functioning of the beef value chain as well as the low bargaining power of small producers.

4.7.3 Social involvement

This section examines 3 main questions:

- Do communities participate in decisions that impact their livelihoods?
- Are there actions to ensure respect of traditional knowledge and resources?
- Is there participation in voluntary communal activities for the benefit of the community?

Decisions that may impact cattle farming and communities may involve farmers' unions but these unions are not perceived by farmers as being their representatives. When it comes to more general issues and traditional leadership, Manyena (2014) notes that despite seemingly overwhelming changes during colonial and post-colonial times, "traditional chieftaincy did not 'disappear'. Through the "traditional leaders act", the Government recognizes the authority of traditional leaders and of related traditional organizations (but there is strong government's interference in the selection of chiefs). The duties of traditional leaders include notifying the local authority for the area concerned

of any natural or human-induced disasters affecting inhabitants, crops, land, flora, and fauna including livestock (Rep. of Zimbabwe, 2001). However, we could not check the impact of this responsibility on cattle management and the beef value chain.

There are many collective activities intended to benefit communities, such as livestock development committees (but which are clearly driven in practice by the veterinary services) and more community driven ones like traditional forms of collective work and saving.

The livestock development committees

Communities' involvement in the beef value chain is based at the farm level on the livestock development committee (also known as 'Dip tank committees').

The explicit purpose of dip tanks is to fight against tick-borne diseases in communal areas and A1 farms (large scale farms organize their own dipping). Technically, a dip tank contains a acaricide treatment, reducing cattle tick infestation. However, dip tanks organisations have many other functions. They are a heritage of the colonial period, during which they were built using forced labour and forced financial contributions (Mavedzenge et al., 2006; Mwatwara 2014). Since then, farmers are required to drive their herds regularly to dip tanks, where veterinary officers and inspectors have the authority to control animal health status. It also provides an opportunity to register the farmers and their cattle (on a stock card) and to collect taxes ($2 year per animal). The dip tank network thus appears to be a powerful institution based on a dense network covering the territory (there are 4,000 dip tanks in the country) which allows animal sanitary controls, the production of statistics, and beyond this the supervision of farm activities.[54]

Nowadays, the functioning of the dip tanks is deeply affected by a lack of resources (with, as a consequence, a resurgence of tick-borne diseases). A local committee of 7 cattle owners (chairman, vice chairman, secretary, treasurer and three committee members) is in charge of supporting the dip tank attendant (a veterinary extension assistant) to organize dip tank sessions: water supply, dip tank maintenance… (5% of the levies collected at the dip tank are allocated to the livestock development committee to assume these tasks).

The livestock development committee is considered to be a community-based association but its functioning is closely linked to the veterinary authorities. The dip tank sessions are the main way for farmers to access veterinarian services and advice. As disease is the first cause of cattle death (Food and Nutrition Council and SIRDC, 2016), improving the functioning of these committee should be a priority.

Traditional organizations/institutions (formal and informal)

Traditional organizations are important for farmers with no cattle when it comes to building a herd or to access draft power.

[54] During the liberation war, to mark their insubordination to the colonial power, the guerrilla encouraged black farmers to avoid dip tanks, even to fill them with stones or to destroy them (Chitiyo, 2000).

The strength of social capital possessed by a household within a community is important to support access to cattle for those who do not own cattle, in particular young farmers. Heads of cattle can be loaned out to friends and relatives. It is a way to access draft power, milk and eventually calves (according to the arrangement).

Farms with no cattle can also rely on traditional forms of collective work, like *Zunde raMambo* or *Nhimbe* in the Zambezi valley: one household invites others to provide labour and draught power for use during activities such as ploughing, planting, harvesting and threshing. The host prepares food, refreshments and beer for consumption while the invitees work on the task required (Mavhura, 2017). There also is an exchange system of days of cattle draft power for days of human labour. This arrangement enables poor households to use livestock they do not own.

We also described in the gender section the role of a traditional social organisation to access credit (*Isal*).

The strength of social networks and social organizations in resettled areas has not been documented.

4.8 Living conditions

This section examines living conditions in relation to 1) access to health services, 2) housing conditions, 3) access to education and training, and 4) mobility. The living conditions in Zimbabwe in relation to health, housing and education have been described in different reports such as the Zimbabwe Millennium Development Goals (MDG) progress report (UNDP 2012) and the Zimbabwe Demographic and Health Survey (ZDHS) (ZimStat, 2012 and 2015a). We focus here on the potential specificities of the livestock value chain. The results are summed up in Table 42.

Assessment Category	Summary of Findings	Status
Health services	The problem of health services is related to their low availability (public ones) and accessibility (private ones). Like in any other economic sector, the development of formal employment in the beef value chain (in abattoirs, feed companies etc.) could contribute to improved access to health insurance.	Substantial
Housing	Access to water and electricity and housing conditions are problematic in rural areas but this is not specific to the beef value chain.	Substantial
Education & training	Education is a key concern for most families and paying school fees is one of the main functions of cattle ownership.	Substantial
Mobility	Temporary migration to neighbouring countries has a positive impact since remittances are often used to invest in cattle upon return.	Moderate/Low

TABLE 42: LIVING CONDITIONS - MAIN FINDINGS AND SCORING

4.8.1 Health services

This section examines 3 main questions:

- Do households have access to health facilities?
- Do households have access to health services?
- Are health services affordable for households?

Access to health services is limited in particular for rural people. For most people in rural areas, access to health care mainly relies on public health services. According to the Zimbabwe Agenda for Sustainable Socio-Economic Transformation, ZimAsset, (Rep. of Zimbabwe, 2013): “the health delivery system continues to be adversely affected by sporadic outbreaks of epidemics such as typhoid and dysentery, increased maternal mortality, shortage of funds to procure essential drugs and equipment and to rehabilitate dilapidated infrastructure". Moreover, the country is one of the most affected by HIV with a prevalence that remains high (15% in 2010) despite recent improvements.

The majority of men (91%) and women (93%) do not have health insurance (according to the ZDHS 2012). Most insured people are covered by their employer (7% of men, 6% of women), this excludes people in rural sectors where most people are self-employed [74% of self-employment in the rural sector, (Zimstat, 2015i)].

The situation of many farms workers has been affected by the fast track land reform. Before the reform, many of these workers were housed by the farm owners and access to health and education for children often was provided in a paternalistic manner by their employers. With the eviction of farm workers from the seized farms, they have lost access to these services.

In relation to the beef value chain, the situation in the large-scale abattoirs needs to be emphasized: These abattoirs have to respect strict hygiene standards and are under the control of veterinary inspections. That is why abattoir workers must have one medical exam per year (but we were unable to explore what the consequences were if a health problem was detected during one of these visits). In some of the abattoirs visited, a health centre was accessible on site for the workers.

As in other economic sectors, the development of the beef value chain could contribute to creating formal employment following the NEC agreement; this could improve access to health insurance for the workers and compensate for the deficiency of the public health services.

4.8.2 Housing

This section examines 2 main questions:

- Do households have access to good quality accommodations?
- Do households have access to good quality water and sanitation facilities?

There is an important difference between urban and rural households regarding access to quality water and sanitation. According to Zimstat (2012), 75% of rural households obtain water from a source that is not within the immediate vicinity of their dwelling place, with 28% reporting that it takes 30 minutes or longer to reach the water source (whereas in urban areas, water is available within the dwelling or plot for 80% of households). Moreover, in many cases, cattle and people share the same water facilities or boreholes (EU, FAO, 2014).

Access to sanitation is also limited in rural areas: more than half of rural households do not have access to improved facilities (only 7% of urban households). Open defecation is still widespread which raises important safety issues. Differences between urban and rural areas regarding access

to electricity are even more significant: only 13% of rural households have access to electricity compared to 83% of urban households.

Workers on large-scale farms, when housed by their employers, can sometimes benefit from access to electricity, television and water supply in their houses (our interviews). However, housing conditions of farm workers have deteriorated since the land reform since the new land owners do not offer the same facilities. This includes workers on commercial livestock farms. The housing of farm workers is currently one of the major issues related to working conditions according to GAPWUZ, one of the farm workers unions (source: our interview).

4.8.3 Education and training

This section examines 3 main questions:

- Is primary education accessible to households?
- Is secondary and/or vocational education accessible to households?
- Is in-service vocational training provided by investors in the value chain and if so, what is the quality?

The MDG reports found positive trends in relation to universal primary education (MDG2) and gender equality in schools (MDG3): in rural areas, 86.6% of children attend primary school (88% in urban areas) and 43.5% attend secondary school (58.7% in urban area) (ZimStat, 2012). In Zimbabwe, there is a strong tradition of education policy. School fees are relatively high ($11/trimester for primary school and $21/trimester for secondary school), but schooling is a priority for most families. Those families who cannot afford to send all of their children to school will at least try to send one child one year, and another child the following year.

As mentioned previously, there is a positive link between cattle ownership and school attendance, since paying school fees is one of the main functions of cattle. Any interruption in the beef value chain may impact the payment of school fees as testified by the reaction of beef producers in Masvingo province in relation to a FMD outbreak in 2014 (see Box 7).

Beef Producers Call For Lifting Of Cattle Ban. "Masvingo Beef Producers Association has pleaded with the Veterinary Services to lift the bracket cattle sales ban which was affected a few weeks ago due to Foot and Mouth outbreak in Masvingo. 'Cattle slaughter has come close to a halt and this has left farmers, dealers, slaughterhouses and butcheries in a very difficult situation. Universities, colleges, primary and secondary schools have opened and the source of income is the cattle in our kraals. Farmers cannot manage to pay the fees because they do not have the money to do so', he added".

BOX 7: ANIMAL DISEASE QUARANTINE AND SCHOOL ATTENDANCE
Source: Voice of the People, 23/09/2014[55]

[55] *HTTP://WWW.RADIOVOP.COM/INDEX.PHP/BUSINESS/11245-BEEF-PRODUCERS-CALL-FOR-LIFTING-OF-CATTLE-BAN.HTML, ACCESS ON 15/03/2018*

4.8.4 Labour mobility

This section examines 2 main questions:

- Does labour mobility and migration provide positive economic opportunities?
- What is the government's policy on labour migration?

Since colonial times and until 2000, Zimbabwe was a major destination for migrants from neighbouring countries. Their number has decreased with the collapse of the economy. There were still 207,000 migrants in 2014, 78% of them labour migrants (ZimStat, 2015a: 218) mainly from South Africa (45%), Mozambique (22%) and Malawi (15%).

Today, Zimbabweans, mainly men but also women, skilled and unskilled, are migrating to neighbouring countries (Zanamwe and Devillard, 2010). Remittances can bring positive benefits to the country when invested in productive economic activities. In relation to the beef value chain, temporary migration is often the way to obtain the money needed to buy the first head of cattle, and then for a young farmer to settle down.

Moreover, migration also impacts cattle related activities. As migrants are mainly men, during the husband's absence, the wife takes over responsibility for the household and decision making, including in relation to cattle when they are held by the household. The impact on cattle management is unknown.

Labour mobility can have a positive impact by supporting investment in cattle and empowering women.

4.9 Conclusions of the social analysis

This section summarises the main findings of the social analysis. It summarizes the assessment of the six social domains. Appreciations for each of the six domains (from not at all to high are given based on the appreciation of the component questions in each sub-domain (see Table 43 and Figure 42). They are discussed in order to answer the two framing questions: Is the economic growth inclusive? Is the value chain socially sustainable?

Domain	Present profile
1. WORKING CONDITIONS	Substantial
2. LAND & WATER RIGHTS	Not at all
3. GENDER EQUALITY	Moderate/Low
4. FOOD AND NUTRITION SECURITY	High
5. SOCIAL CAPITAL	Moderate/Low
6. LIVING CONDITIONS	Moderate/Low

TABLE 43: APPRECIATION OF EACH DOMAIN OF THE SOCIAL ANALYSIS

'Not at all' indicates drawbacks and potential risks while 'high' indicates positive conditions and potential social benefits.

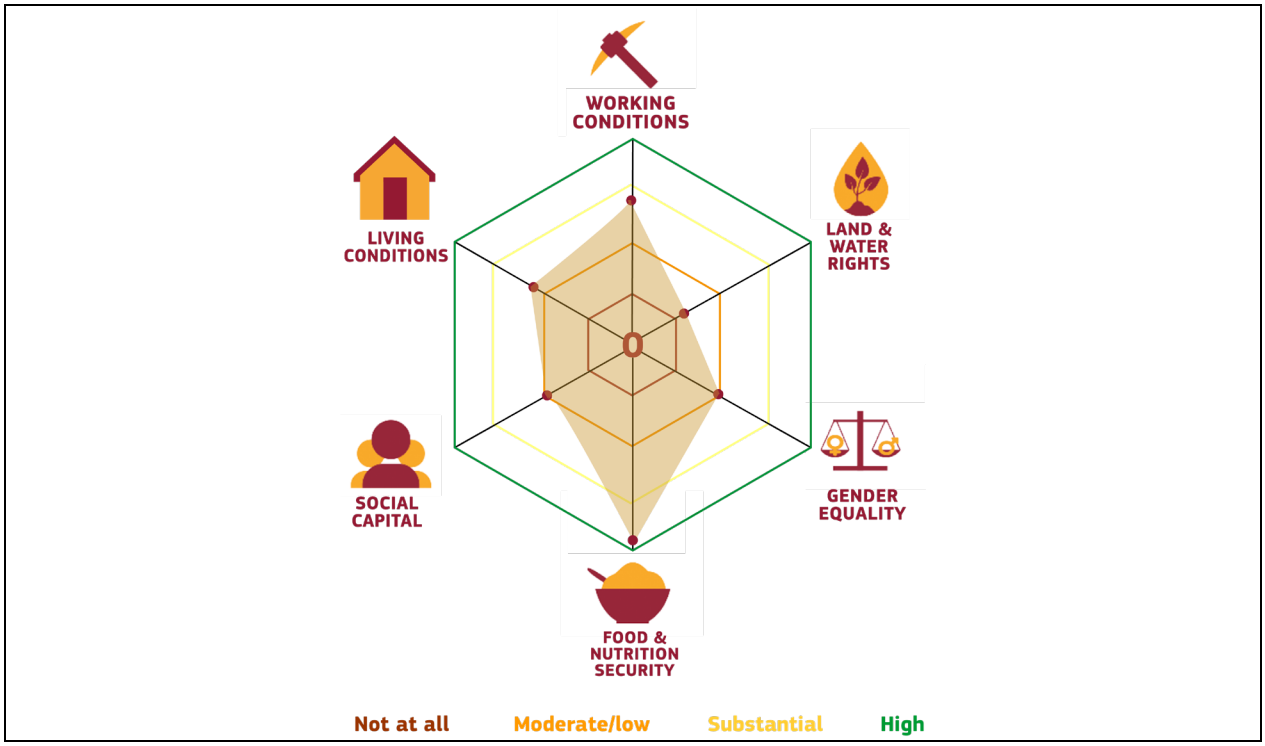


FIGURE 42: SOCIAL PROFILE

Working conditions. Most of the people engaged in cattle related activities are self-employed communal farmers and their families. As cattle are mainly a source of draft power, cattle ownership facilitates farm work (ploughing, seeding, transport…), increases work productivity and contributes to improving the working conditions of farmers. Children (boys and girls), as family members, may be involved in herding and milking activities but this does not affect school attendance.

In relation to employed workers, the working conditions are relatively good compared to other production sectors, which are more labour intensive (e.g., sugar cane plantations). Working conditions in large-scale abattoirs are above the average, in particular in relation to occupational health and safety due to a strong legislative framework.

One concern is related to the suspension of work and wages when the functioning of the beef value chain in interrupted (e.g., in the case of a disease outbreak). Another concern relates to workers in drugs companies: they are exposed to chemicals with no systematic protection. We are moreover aware that our analysis would have benefited from a deeper exploration (e.g., visit of farm workers' housing, focus groups with farm and slaughterhouse workers…).

Land and water rights are a complex issue in the context of Zimbabwe. For example, grazing areas (including fodder trees) may fall under different types of land tenure such as communal area, private land with or without official land title, rented land… These land tenure rights have been challenged by different past and current policies (implemented without a consultation process) in relation to land reform, parks and wildlife management and territorial control of Foot and Mouth Disease (FMD).

In a context of high land concentration inherited from the colonial period, land reform has given land rights to numerous families. However, land insecurity (related to a lack of title deeds, lack of formal rent contracts) today limits potential investments in cattle production. Proximity to conservancy areas increases the risk of wildlife conflicts and cattle losses; without a compensation scheme, this situation increases the risk of investing in cattle for beef production. Moreover, the poor conditions of water boreholes, dams and wells amplify the impact of drought periods. Finally, the territorial control of FMD (by zoning the country into FMD-free and not-free zones) implemented in the past benefited an export-oriented commercial beef sector that was not very inclusive; the relevance of its re-establishment should be seriously questioned.

Gender equality. Cattle ownership and management is traditionally a male activity, except for milking and manure valorisation. Women are much more involved in goat and chicken related activities. Consequently, access to draft power for heavy work (which cannot be done by donkeys) may be a concern in female-headed households.

A first question is whether the development of the beef value chain would compete with other, more female-driven livestock activities. At the farm level, it seems that there is no competition. At a larger scale, it is clear that livestock extension services are currently very focused on cattle (and health issues) to the detriment of female-owned livestock (i.e., goats).
Another question is whether women can benefit directly from the development of the beef value chain. Those encountered declared an interest in cattle ownership and pen fattening activities. However, it is difficult for women to participate since they have limited access (even no access) to the main means of building up a herd (herding, migration). The other stages of the beef value chain (slaughterhouse, feeding companies) mainly offer employment to men. Nevertheless, cattle-related projects conducted by NGOs, such as pen fattening projects, help to reduce this discrimination since the inclusion of women is one of their priorities.

Food and nutrition security. Cattle are an asset rather than a direct source of food. However, cattle ownership directly contributes to food accessibility and is essential to secure access to food on small-scale farms. Cattle provide draft power and manure, and cattle ownership is positively correlated to the production and yield of staple foods. Moreover, cattle ownership contributes to household resilience in case of a shock or crisis (climatic, financial…). It is therefore essential that the different projects aiming to develop the beef value chain do not come into competition with, and do not compromise, the different functions assumed by cattle for their owners and their families such as providing draft power, fulfilling social obligations, providing a secure form of saving, producing manure and milk.

At the national level, in a context of very low dietary diversity and nutrient deficiency, cattle products (meat, milk) are essential to improve the nutritional status of the population. At the moment, there is strong competition from the poultry chain since chicken meat is more affordable. However, as the environmental impacts of extensive cattle production are low (and probably much lower than those of the poultry value chain – See Section 5 below), the development of the beef value chain should be considered as a priority to improve national meat availability. The contribution of the beef value chain to national food and nutritional security should be the priority focus rather than its

contribution as a source of foreign currencies, which was the focus in the past when the sector was export-oriented.

Social capital and information. Despite important problems in securing beef supplies, the abattoirs are the most influential stakeholders in the value chain. The whole value chain is characterized by a lack of trustworthy relations. Farmers are poorly organized and poorly represented in decision bodies; they lack market information, and their bargaining power is low.

Nevertheless, farmers have been able to resist different successive policies that have ignored the complex role of cattle in rural livelihoods. They have proven their capacity to equip the farms resulting from the fast track land reform with draft power, to occupy part of the economic space released by the dismantlement of large scale livestock farms, and to adapt to a highly variable and uncertain context.

The farmers encountered showed a high interest in investing in pen fattening activities but are quite limited by their capacity to invest. Securing farmers' legal and financial environment would be a more effective means to encouraging farmers' involvement in the beef value chain than "changing farmers' mentality", a remark that is often heard, even from some farmers' union representatives.

Living conditions. Despite slow improvement, living conditions in Zimbabwe are poor, as can be expected in a country ranking 154 out of 188 countries in the Human Development Index (HDI) (UNDP, 2016). Issues related to living conditions (access to health services, sanitation, water and electricity) are not specific to the beef value chain. Nevertheless, there is a direct relationship between cattle and education since paying school fees is one of the main functions of cattle ownership. Moreover, labour mobility to neighbouring countries also has a positive impact since remittances are often used to invest in cattle when the migrants return. The study of the living conditions of populations located near large-scale abattoirs should receive more attention in relation to waste management.

Key mitigation measures

Very general measures would benefit the beef value chain and mitigated some of the risks identified. These include: improved enforcement of international standards on labour rights, land and water rights, and elimination of discrimination against women. In relation to issues more specific to the beef value chain, the following key mitigation measures could be implemented:

Stakeholder's organizations. The low bargaining power of farmers in the beef value chain could be addressed by supporting cattle producers' associations, at local and national level. Incentives should be given for the set up of a cattle producers' association inside LMAC, representing their diversity. This could contribute to a more fair relationship in the beef VC, in regards with topics such as payment of the revision of the grading system, the control of tax rises and of their use. Strengthening the workers' committees in the companies (abattoirs, vet drugs and feed companies...) should also be an objective.

Extension services. There a need to support extension services and livestock policies that can embrace a diversity of 1) species (not only cattle but also women' livestock, i.e. goats and poultry), 2) thematic (not only health but also feeding practices for example), 3) diseases (not only FMD but also diseases with high mortality rate), and 4) disease control strategies (not only zoning and exclusion, but also alternatives strategies to manage FMD: vaccination, Commodity Based Trade, animal tracking system.

Market information systems could be set up for farmers and based on the network of dip tanks.

Gender. Rural women should be supported to participate in the beef value chain (e.g. in acquiring cattle) and in the process of decision-making. The composition of the Livestock Development Committees could aim at a proportional representation of women registered in these committees (i.e. female "stock card holders")

At the present, donors' interventions mainly focus on communal farms. But there is a need to include the other types of farms and in particular the ones in the areas of resettlement. In these areas, projects could support mechanisms for land dispute resolution, land securitization, water points' rehabilitation and so on. This will also allow taking into account the complementarities (present and potential) between these farms (including large scale farms) in the functioning of the beef value chain.

5. ENVIRONMENTAL ANALYSIS

5.1 Introduction and background

The environmental analysis of the Zimbabwean Beef Value Chain is based on the Life Cycle Assessment (LCA) methodology described in two ISO norms (ISO 14040 and 14044). This methodology includes four steps as described in Figure 41 representing the four parts of this analysis. Although the relevance of this framework for evaluating the environmental impacts of agricultural and food products has been demonstrated, its application to livestock products, especially in Africa, presents several key challenges. As part of the DEVCO project, methodological guidelines have been designed for a reliable and consistent application of LCA to these systems. These guidelines will be followed in this study.

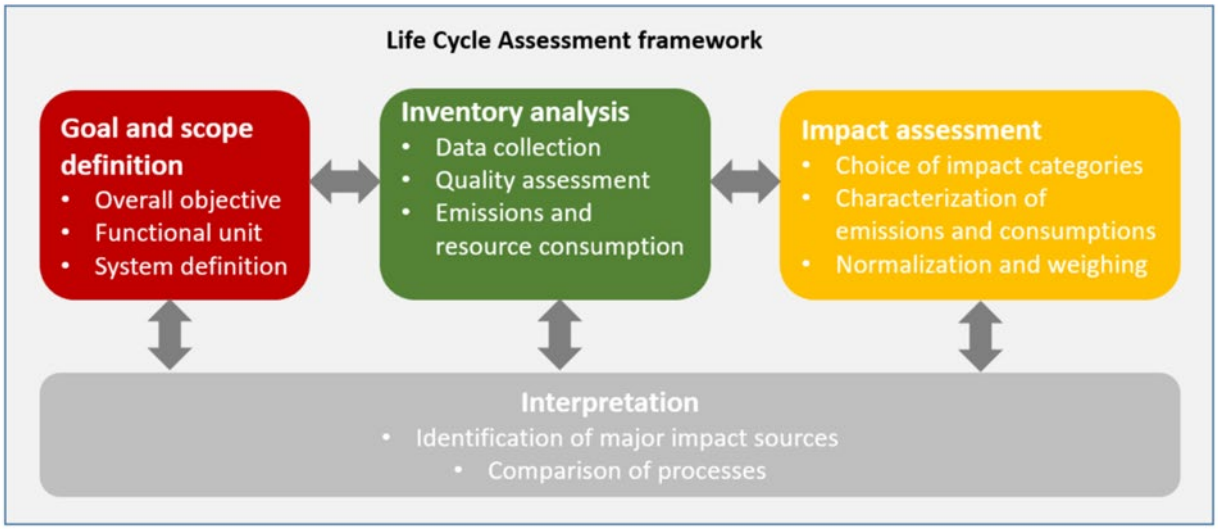


FIGURE 43: THE FOUR STEPS OF A LIFE CYCLE ANALYSIS

5.2 Goal and scope definition

5.2.1 Objectives

This LCA study is a part of a study aiming to produce knowledge about the growth, inclusiveness and sustainability of the beef VC in Zimbabwe. It aims more specifically to answer to the following question: Is the Zimbabwean beef VC environmentally sustainable?
The key objectives of this LCA study is so on:

- To evaluate the impacts of the beef VC in Zimbabwe;
- To calculate the contribution of the main stages of the life cycle for the products;

Regarding the specificity of the Zimbabwean Beef Value Chain, two specific objectives have been added;

- To evaluate and compare (from cradle-to-market) two sub-VC: one rural consumers-oriented and one urban consumers-oriented; and,
- To evaluate and compare (from cradle-to-farm-gate) the main farming system types identified during the functional analysis.

5.2.2 System boundaries

Spatial boundaries

Given the global objectives of this LCA study, the system boundaries were set from cradle-to-national market in Zimbabwe (Figure 44).

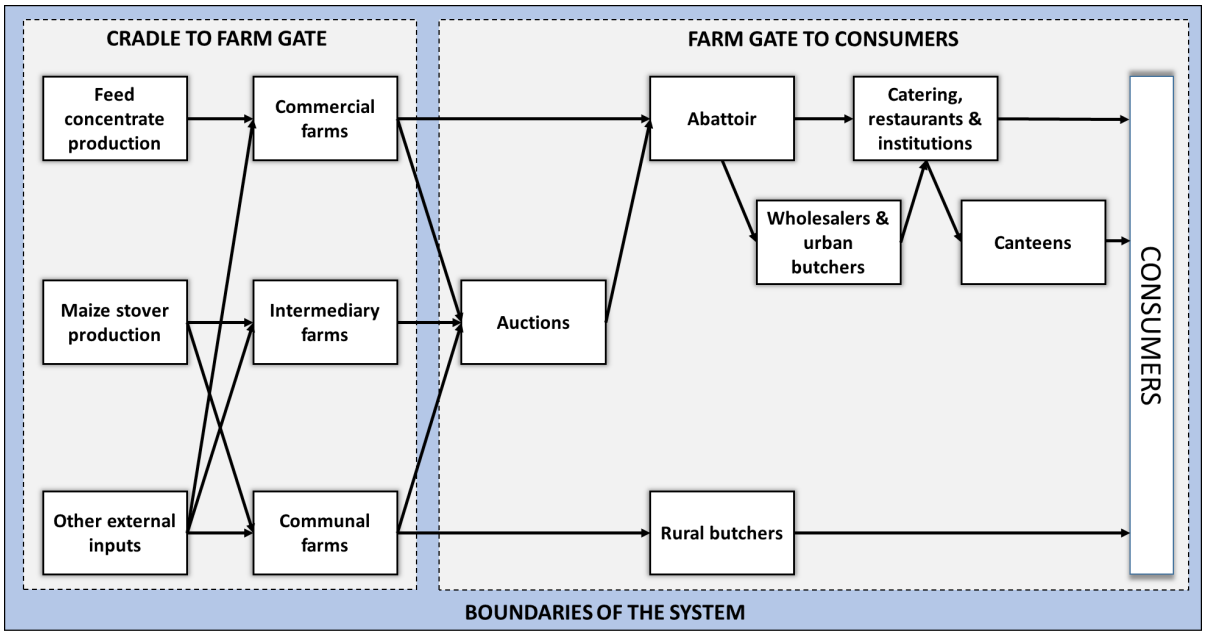


FIGURE 44: SYSTEM BOUNDARIES OF THE LCA STUDY

This representation is simpler than the one proposed in the Functional Analysis (Figure 1). Firstly, middlemen have been deleted as few inputs are consumed at these stages. They have been considered only as "supplementary transporters". Flows accounting for less than 2% of global amount of equivalent carcasses produce in the VC (e.g. exchanges between farms or auctions and middlemen) have also been excluded. As a consequence, remaining flows represent 83% of all flows.

We can note two sub-VCs: a "rural consumer-oriented" and an "urban consumer-oriented" both presumed in the Figure 45. Each one represents respectively 21% and 79% of the global estimation of kg equivalent carcass consumed at market stage. The "rural consumers-oriented" sub-VC is more direct with animals, mainly from communal farms (97% of animals) slaughtered in rural butcheries (Figure 46) and then meat purchased by consumers. The "urban consumers-oriented" is more complex with slaughtering mainly in abattoir followed by interlinks between different intermediary actors. Final retailing to consumers is allowed by three types of actors (in line with the shares identified in the functional analysis): wholesalers and urban butchers (35%), catering (32%) or informal retailers (11%).

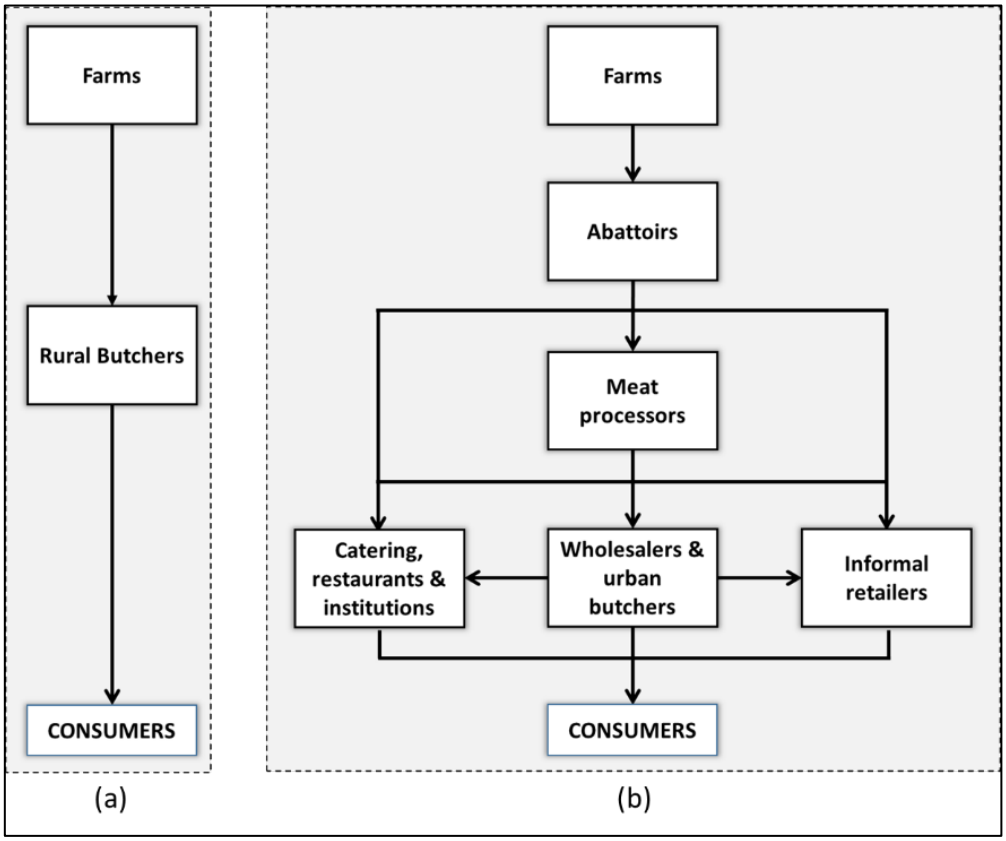


Figure 45: Representation of the two Zimbabwe beef sub-value chains: a) rural consumer orientated sub-VC, and b) urban consumer orientated sub-VC

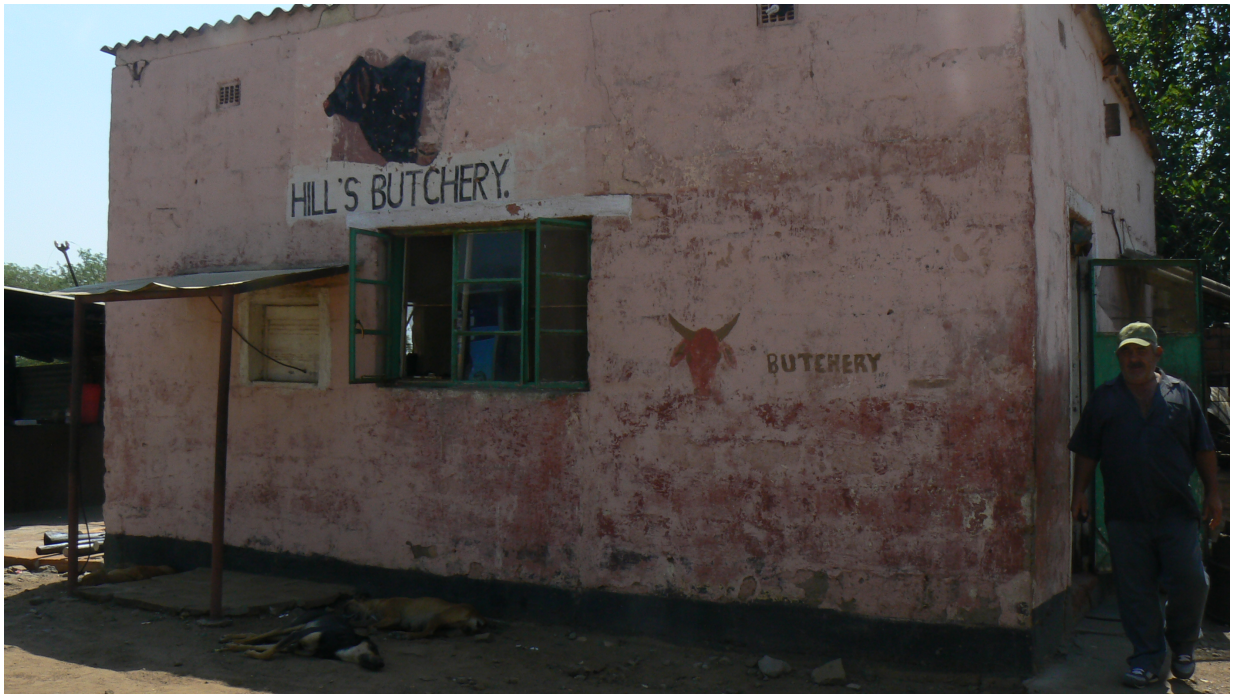


Figure 46: Example of a rural butchery
Source: Photo credit, Muriel Figuié

This LCA study includes the inputs (feed, energy, water, land) and the emissions to soil, water and air at the different stages of the VC: farming, slaughtering, processing and retailing.

Temporal boundaries.

The assessment is led on a typical one year.

5.2.3 Systems studied

For each actor, an archetype of system has been built, with the exception of beef production systems for whom, similarly to the functional analysis, three production systems have been considered. The different data are from interviews with Zimbabwean stakeholders and contextualised literature references. Table 44 indicates some key data the three beef production systems. Table 45 show data for a semi-commercial maize production system. Table Table 46 shows data for the feed producers. Table 47 indicates data for slaughtering, processing and retailing functions. With the exception of maize production, data are similar to those used in economic analysis.

Beef production systems

Variable	Unit	Communal Farms	Communal / Commercial Farms	Commercial Farms
HERD COMPOSITION				
Mature Cows	head	3	14	290
Bulls	head	0	2	14
Heifers > 2yrs	head	0.37	3.8	99
Heifers > yearlings	head	0.37	3.9	100
Steers > 2 yrs	head	0.37	3.6	98
Steers yearlings	head	0.37	3.7	99
Unweaned calves	head	0.38	3.9	101
Weaned calves	head	0.38	3.9	100
EQUIPMENTS				
Clamp / Kraal	nb	1	1	1
Fences	m		2,530	8,390
Borehole	nb		1	2.5
Scotch cart	nb	1	1	1
Tractor	nb			1
Trailer	nb			1
Grass cutter and rake	nb			1
INPUTS				
Vaccines	dose	15.72	116.4	901
Antibiotics	dose			901
"3 in 1" medicines	dose	10.48	155.2	
Triatix (dipping)	ml	3,144	279.36	6,487.2
Maize stover	kg	1,129	8,694	
Fuel	L			500
Lick	kg			90.1
Water	L		1,940	270,300
Feed concentrates	kg			177,300
GHG FLOWS				
Direct enteric CH4	kgCH4	207.44	1,412.8	32,281
Direct N2O	kgN2O-N	0.051876	0.38412	8.9199
Indirect N2O	kgN2O-N	0.0155628	0.115236	2.67597
NO	kgNO	0.042444	0.31428	7.2981
LAND AREA				
Communal grazing area	ha	300	35.5	1,320
OUTPUTS				
Milk	L	162	2,520	783
Ploughing	ha	5	6	
Manure	Mt	27	206	5,120
Mature cows	head	0.37	3.3	99
Bulls	head		0.3	3
Steers > 2 yrs	head	0.37	3.3	95

TABLE 44: KEY AGRONOMIC DATA FOR THE THREE BEEF PRODUCTION SYSTEMS

Maize cropping system

Variable	Unit	Amount
EQUIPMENT		
Animal Drawn Plough	Unit	1
INPUTS		
Seeds	Kg	25
Mineral fertilizer (compound D)	Kg	275
Ammonium nitrate	Kg	100
Lime	Kg	250
Dipterex 2.5%	Kg	4
Carbaryl 85	Kg	0.625
Lasso	Litres	3
Stella Star	Litres	1
Fuel	Litres	8
Lubricant	Litre	0.01
Bags	Units	50
Twine	M	25
GHG FLOWS		
Direct N2O	kgN2O-N	0,5275
Indirect N2O (volatilization)	kgN2O-N	0,0211
Indirect N2O (leaching)	kgN2O-N	0.1186875
Direct CO2 (lime)	kgCO2	30
Direct enteric CH4 (Ploughing, discing and planting)	kgCH4	0.0630137
LAND USE		
Cropping area	ha	1
OUTPUTS		
Grain	kg.ha-1	2,500
Stover	kg.ha-1	2,500

TABLE 45: KEY AGRONOMIC DATA FOR THE MAIZE PRODUCTION SYSTEMS

Feed producers

Variable	Unit	Amount
EQUIPMENTS		
Feed mill	Unit	1
Office	Unit	4
INPUTS		
Maize	Kg	201,600
Maize bran	Kg	1,296,000
Cotton seed hulls	Kg	648,000
Molasses	Kg	540,000
Cotton seed cake	Kg	360,000
Whole cotton seed	Kg	360,000
Lime flour	Kg	90,000
Urea	Kg	72,000
Salt	Kg	25,200
Minerals & vitamins	Kg	7,200
Fuel	L	16,200
Bags	Units	72,000
Electricity	kWh	53,720
Water	m3	75,236.4
LAND USE		
Urban Area	Ha	0.5
OUTPUTS		
Feed Concentrates	Kg	3,600,000

TABLE 46: KEY DATA ESTIMATED FOR THE INVENTORY OF FEED PRODUCERS

Slaughtering, processing and retailing

Variable	Unit	Rural butchers	Abattoir	Meat processors	Catering	Urban butchers
EQUIPMENTS						
Freezer store[a]	unit	1	1	0.8		1.6
Sausage filler	unit			0.4		
Table	unit	1	4[b]		1	1[b]
Plates & Cutlery	unit				60	
Serving counters	unit				4	1
Knives	unit	2				
Saw	unit	1				1
Cutting block	unit	1				2
Scales	unit	3				1
Cookers	unit				0.6	
Building	m2	25	1,000	1,000	200	
7mt truck			1			
3.5mt truck			2			
5mt refrigerated truck			1	1		
2mt refrigerated truck			2	1		
Pick-Up		1			1	1
INPUTS						
Animal	head	48	18,250			
Electricity	kWh	300	146,940	86,208	4,041	17,628
Potable Water	m3	0.3	949	465	565	1.2
Desinfectants	L	60	1,200	660	36	264
Carcass	kg			720,000	108	23,040
Fat	kg			144,000		
Trimmings	kg			288,000		
Casings	kg			57,600		
Spices	kg			11,400		
Soyabeans	kg			96,000		
Fuel		205	60,429	4,351	264	154
Gas	L				141	
LAND USE						
Urban Area	ha	0.0025	0.1	0.1	0.02	0.0025
OUTPUTS						
Carcass	%	43[c]	45			
Fat	%	-	3			
5th quarter	%	27	-			
Organs	%	15	-			
Viscera	%	15	-			
Head	%	5	-			
Feet	%	2	-			
Hide	%	5	6			

Variable	Unit	Rural butchers	Abattoir	Meat processors	Catering	Urban butchers
Blood	%	15	16			
Trimmings	%	3	-			
Processed meat	kg			300,000	15,840	22,680
BEEF THROUGHPUT	%	60	100	40	30	40

TABLE 47: KEY DATA ESTIMATED FOR THE INVENTORY OF THE DIFFERENT SLAUGHTERING, PROCESSING AND RETAILING ACTORS

[a] different dimensions (display freezer, cold store, etc.)

[b] stainless steel tables

[c] Including fat

5.2.3 Functional unit

The functional unit enables to quantify the performance of a production system and is used as a reference unit for which the LCA study is performed. It is, therefore, critical that this parameter is clearly defined and measurable. In several beef LCA studies, the weight of the final product destined for human consumption is taken as the functional unit. In this study the functional unit will be "one kg of equivalent beef carcass available to consumers".

Kg of equivalent beef carcass has been chosen as the beef product proposed to the consumers is different according the retailer. For instance, catering propose plate with a part of beef meat whereas this is carcass (or at least part of the carcass) which is available in butcheries.

5.2.4 Allocation

When a production system has more than one output, the environmental impacts induced by this production system need to be partitioned between its different co-products. Different rules (bio-physical rules, energy content, mass balance…) could be used as a basis for allocation and the allocation method could have an important influence on the final results of an LCA.

In this study, when needed, an economic allocation is used at each actor level related to prices of the different outputs given in Table 48.

Products	Units	Price (in Z$ per unit) for the different products at different steps					
		Maize producer	Communal Farmers	Com/Com Farmers	Commercial Farmers	Urban butchers	Abattoirs
Maize grain	Kg	0.39	-	-	-	-	-
Maize stover	Kg	0.15	-	-	-	-	-
Milk	L	-	1	1	1	-	-
Ploughing	Ha	-	50	65	-	-	-
Manure	Mt	-	5	5	5	-	-
Animals	Head	-	350	450	450	-	-
Meat	Kg	-	-	-	-	4	3.61
Organs	Kg	-	-	-	-	2.5	-
Viscera	Kg	-	-	-	-	2.5	-
Head	Kg	-	-	-	-	0.9	-
Feet	Kg	-	-	-	-	4.0	-
Hide	Kg	-	-	-	-	0.0	-
Blood	Kg	-	-	-	-	0.0	0.80
Trimmings	Kg	-	-	-	-	-	0.00
Fat	Kg	-	-	-	-	-	0.80
5th quarter	Kg	-	-	-	-	-	1.00

TABLE 48: OUTPUT VALUES (IN Z$/UNIT) OF THE PROCESSES ACCOUNTED IN THE LCA CONSIDERED FOR ECONOMIC ALLOCATIONS

5.2.5 Data quality

Data representativeness

All actors archetypes have been built on the basis of interviews with different stakeholders or from literature data. These archetypes represent a simple view of the different processes compared to the management and geographical variability. With additional time and resources we would have included more actors and more agroecological zones in the analysis. However, we consider that our dataset constituted the best possible compromise in the time frame.

Data gaps and uncertainties

The main gaps and uncertainties of our dataset are as follows:

- Potential mistakes on primary data themselves given the lack of formal records of farmers
- The uncertainty on farm inputs especially for feeding intakes
- The uncertainty due to the use of default emission factors for estimating field emissions and the non-inclusion of N fixation (lack of knowledge about natural pasture area)
- The uncertainty on input data for processing steps: energy, water and packaging, especially the quantity of can needed per kg of raw product
- The uncertainty attached to the losses of meat across he VC
- The uncertainty on the road distances in Zimbabwe

However, we do not expect these gaps to change drastically the main conclusions of our study.

Data quality assessment

The data quality of our dataset was assessed globally based on recommendations from the ILCD handbook (European Commission et al., 2010). This data quality assessment is based on six data

quality indicators, namely: technological representativeness (TeR), geographical representativeness (GeR), time-related representativeness (TrR), completeness (C), precision and uncertainty (P), and methodological appropriateness and consistency (M). For each indicator a score between 1 and 5, 1 being the best score and 5 the worst, is given independently. Then, the overall quality of the dataset can be derived from the quality rating of the various quality indicators based on Eq. 1:

Eq. 1 $DQR = \frac{TeRc+GR+TiR+C+P+M+Xw*4}{i+4}$

With

DQR: Data Quality Rating of the LCI data set
TeR, GR, TiR, C, P, M: see previously
Xw: weakest quality level obtained (i.e. highest numeric value) among the data quality indicators
i: number of applicable (i.e. not equal "0") data quality indicators
Values given for the different data quality criteria were as follows: TeR: 2; Ger: 2; TrR: 1; C: 2; P: 4; M: 2, resulting in an overall value of DQR calculated for our datasets of 2.9, corresponding to a “basic quality” (between 1.6 and 3).

5.3 Environmental Inventory

5.3.1 On-field emissions and fluxes

For calculating field emissions and fluxes, considering the accuracy of our data, we chose to use mainly IPCC Guidelines, Tier 1 method (IPPC, 2006). Methods for each emission or flux is described in Table 49.

Emissions		Value	Unit	Comment/sources
Methane from enteric fermentation	Bulls, Mature cows, Steers >2yrs and Heifers > 2yrs	46	kg/head/year	IPCC (2006), Tier 1
	Young	31	kg/head/year	IPCC (2006), Tier 1
Methane from manure management		1	kg/head/year	IPCC (2006), Tier 1
N_2O from grazing and kraaling		0.01*Total N excretion*44/28	Kg N_2O/head/year	IPCC (2006), Tier 1
Indirect N_2O (Volatilisation)		0.01*NH_3*44/28	Kg N_2O/head/year	IPCC (2006), Tier 1
Indirect N_2O (Leaching)		Negligible (not irrigated pasture)	Kg N_2O/head/year	IPCC (2006), Tier 1
NH_3		Total N excretion*0.3	Kg NH_3/head/year	IPCC (2006), Tier 1
NOx as NO		0.01*(0.6* Total N excretion)*30/14	Kg NO/head/year	EMEP/EEA (2013)

TABLE 49: DIRECT AND INDIRECT EMISSIONS AT FARMING STAGE

5.3.2 Background processes

Background data for energy production, fertilizer production and pesticide production were mostly based on processes from the Ecoinvent database (Ecoinvent 3 Allocation, recycled content, Unit) the Agri-footprint database with economic allocation (Blonk Agri-footprint BV), and the Agribalyse (v1.3) databases available in the Simapro® software (version 8.3.0.0). The transportation stages from the Ecoinvent processes for energy materials and inputs were not adapted to the Zimbabwean situation since this was not expected to have an important effect on the results.

5.4 Environmental impacts

The life cycle impact assessment (LCIA) stage aims at translating the resource consumptions and the emissions of the life cycle inventory into relevant environmental impacts which are understandable for decision makers. Each environmental flux is connected to a corresponding environmental impact. Once classified in the relevant impact category, a characterization factor will be used to express the relative contribution of the environmental flow to this impact category. The environmental impact could be at midpoint level or at endpoint level. The midpoint is located at the early stages of the cause-effect chain and explains the physico-chemical changes in the environment. The endpoint goes further on the cause-effect chain and explains the damages on the environment and the society.

In order to answer in the most straightforward way to the three questions posed regarding the environmental dimension, an Endpoint LCIA method was selected. An Endpoint LCIA method allows us to calculate integrated environmental impacts for the three commonly used areas of protection: Human Health, Ecosystem Quality and Resources depletion (Figure 47). We selected the Endpoint version of the ReCiPe (Hierarchist) LCIA methodology (www.lcia-recipe.net). Each area of protection

is expressed in Endpoint units: DALY (Disability Adjusted Life Years) for Human health, species*year for Ecosystem quality and $ for Resources and consists of several impact categories. Endpoint results will also be presented per impact category. The endpoints allow us to directly address the three most important environmental safeguard zones that are ecosystem quality, human health and resource depletion. Endpoints are also more relevant for policy dialogue because they give the environmental implications of a product system at a macro level (damages on the society and the environment).

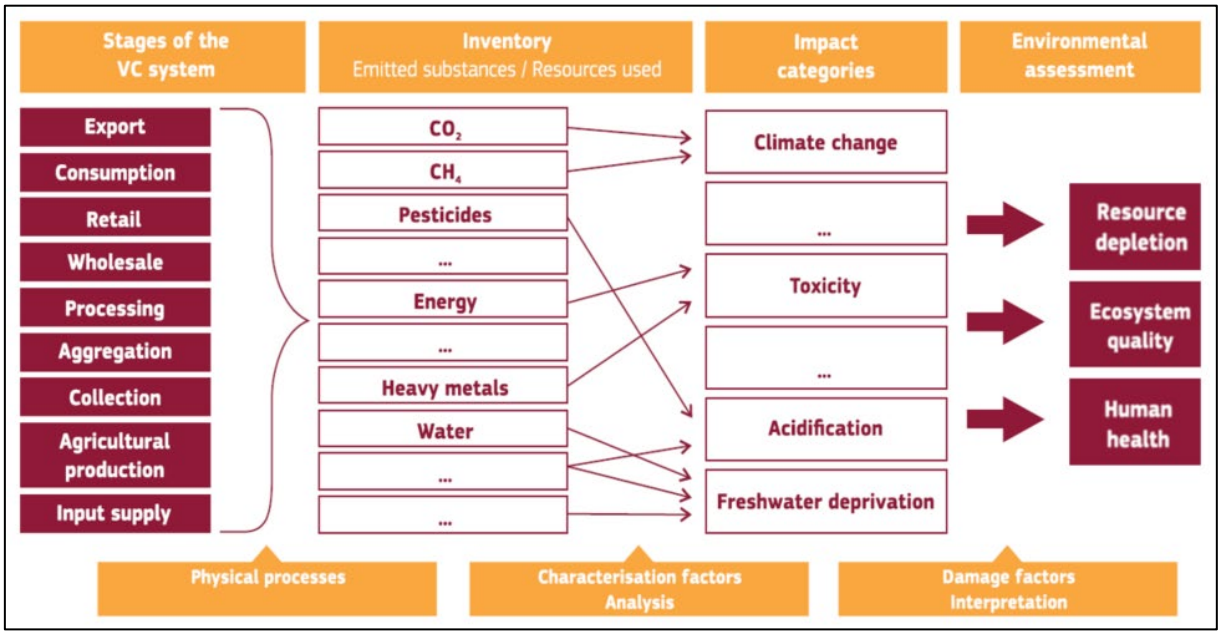


FIGURE 47: AGRICULTURAL-BASED VALUE CHAIN ANALYTICAL PROCESS IN LCA

5.5 Results

5.5.1 Cradle-to-market analysis: Environmental impacts of Zimbabwean beef value chains

Concerning the whole VC, climate change constituted most of the **Human health** damage with 81% of the total impact (Figure 48). The second most important contributor to human health endpoint was particulate matter formation, with contributions around 15% of the total impacts. All other midpoint categories had only minor contributions, equal or less than 2%. **Ecosystems** damage is close to be fully represented by land use with 93% of the total impact (Figure 47). Impact of global warming to terrestrial ecosystems contributes to 6%. Other midpoint categories contribute less than 1%. For the **Resources** area of protection (Figure 49), fossil depletion appeared as the only major contributor (96%) followed by mineral depletion (4%).

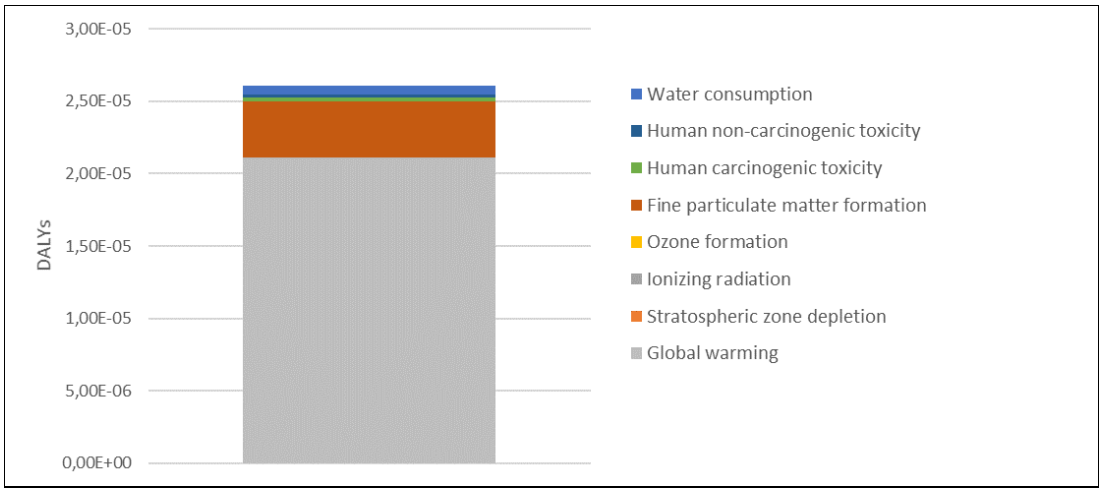


FIGURE 48: CONTRIBUTION OF IMPACT CATEGORIES TO ENDPOINT RESULTS FOR 1KG OF EQUIVALENT BEEF CARCASS (WHOLE BEEF VALUE-CHAIN) - HUMAN HEALTH

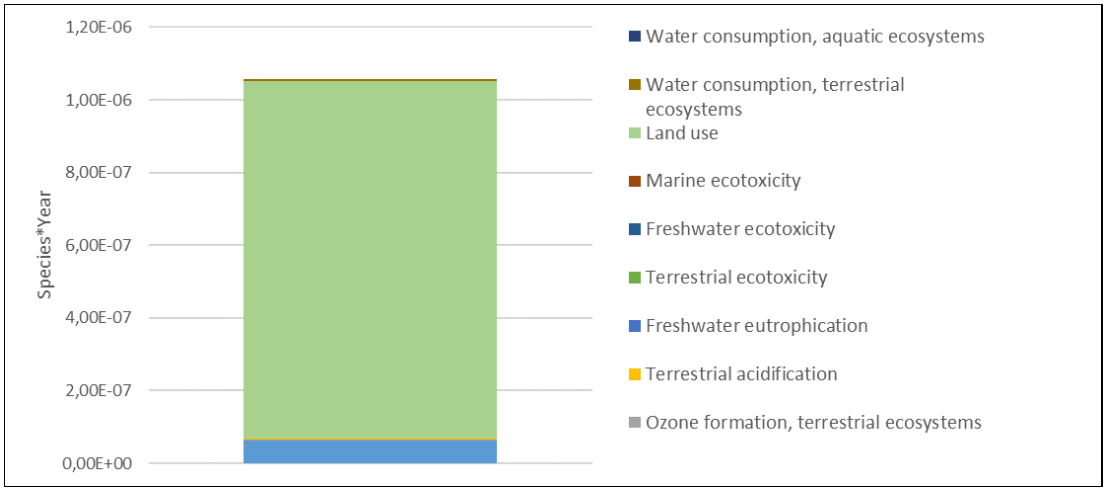


FIGURE 49: CONTRIBUTION OF IMPACT CATEGORIES TO ENDPOINT RESULTS FOR 1KG OF EQUIVALENT BEEF CARCASS (WHOLE BEEF VALUE-CHAIN) - ECOSYSTEM QUALITY

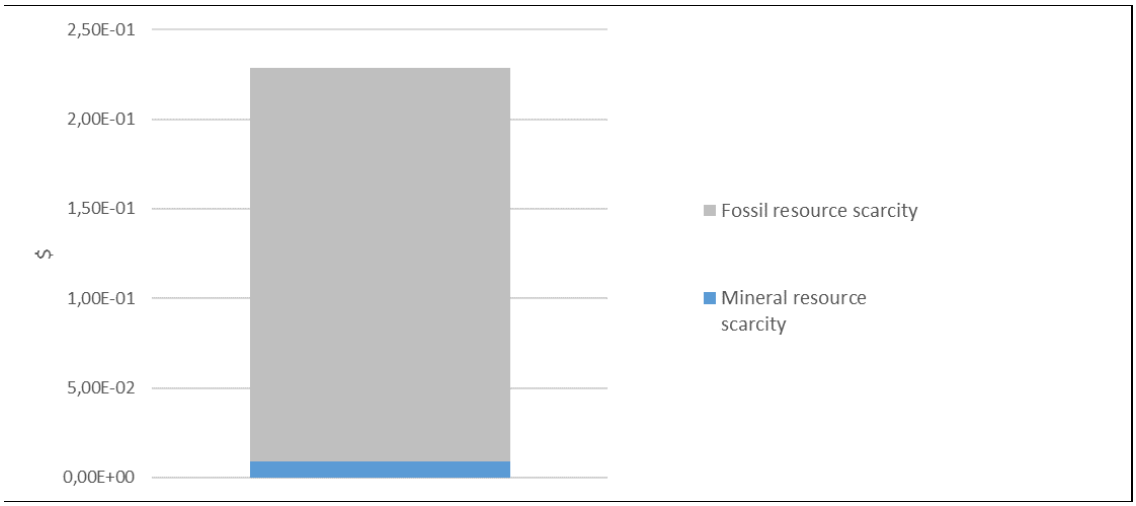


FIGURE 50: CONTRIBUTION OF IMPACT CATEGORIES TO ENDPOINT RESULTS FOR 1KG OF EQUIVALENT BEEF CARCASS (WHOLE BEEF VALUE-CHAIN) - RESOURCES DEPLETION

The general endpoint profile for the whole Zimbabwean beef VC can also be explained by a contribution analysis of the main life cycle stages. Here, according to initial functional analysis and the system boundaries defined for LCA, the chosen stages are the farming systems (cradle-to-farm-gate), the slaughtering (rural butchers and abattoirs), the meat processing (meat processors) and the retailing (urban butchers, catering and informal retailers). Related transport is included in each stage.

As shown in Figure 50, the farming system stage contributes mainly to the three area of protection, respectively 87, 99 and 55% for Human health, Ecosystems quality and Resources depletion. This results are in line with the most part of LCA of livestock products (Roy et al., 2009). Slaughtering stage had a relative contribution on Resources depletion (20%), mainly through water and fossil energy uses. Retailing contributes few to the different area of protection, with only 8% of Human Health damage and 16% of Resources depletion. Finally, contribution of processing is low, with only relative contribution to resources depletion of around 9%.

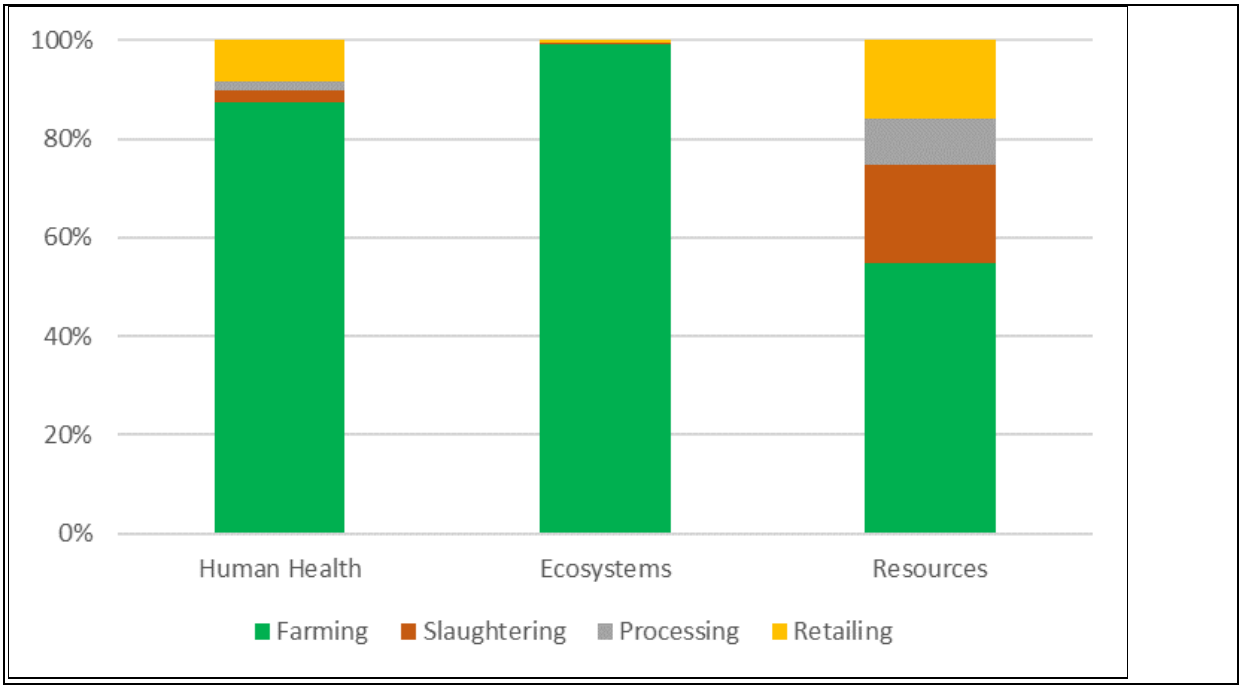


FIGURE 51: CONTRIBUTION OF THE DIFFERENT LIFE-CYCLE STAGES TO THE DIFFERENT AREAS OF PROTECTION

Considering the major role of global warming on Human health impacts and fossil resources uses on Resources depletion, we chose to focus more precisely on greenhouse gases emissions of the VC. Figure 51 shows the contribution of the different GHG at the global emission level of the Zimbabwean beef VC (19,1 kg eqCO2 per kg of equivalent beef carcass). GHG emissions are mainly represented by CH4 (84%), mainly enteric CH4, followed by CO2 due to fossil energy use (15%) and N2O (1%) emitted during fertilizer application.

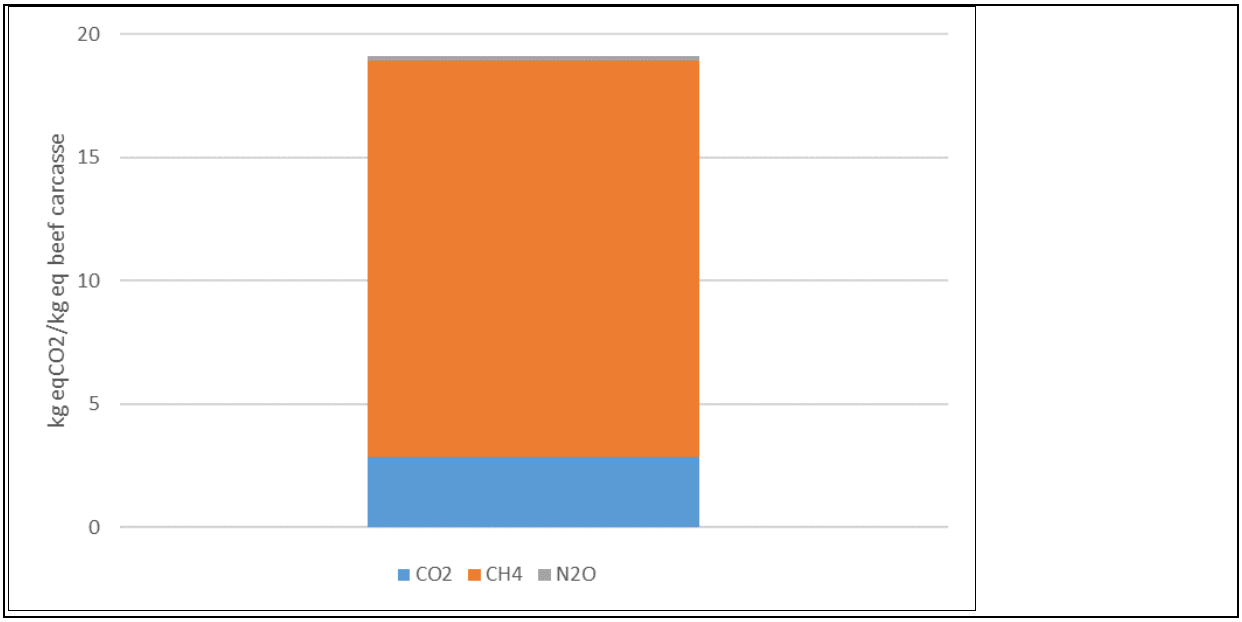


FIGURE 52: GLOBAL GHG EMISSIONS OF THE ZIMBABWEAN BEEF VALUE CHAIN AND CONTRIBUTION OF THE THREE MAIN GREENHOUSE GASES (CO2: CARBON DIOXIDE, CH4: METHANE, N2O: DINITROGEN MONOXIDE)

5.5.2 Cradle-to-market analysis: Comparison of the two beef sub-VC

Figure 53 shows a large difference of impacts for the three areas of protection of the two beef sub-VC for 1 kg of equivalent beef carcass. The rural consumers-oriented sub-VC have widely less impacts than the urban consumers-oriented one. It contributes from 89 (Ecosystems) to 98% (Resources) of the impacts of the different categories.

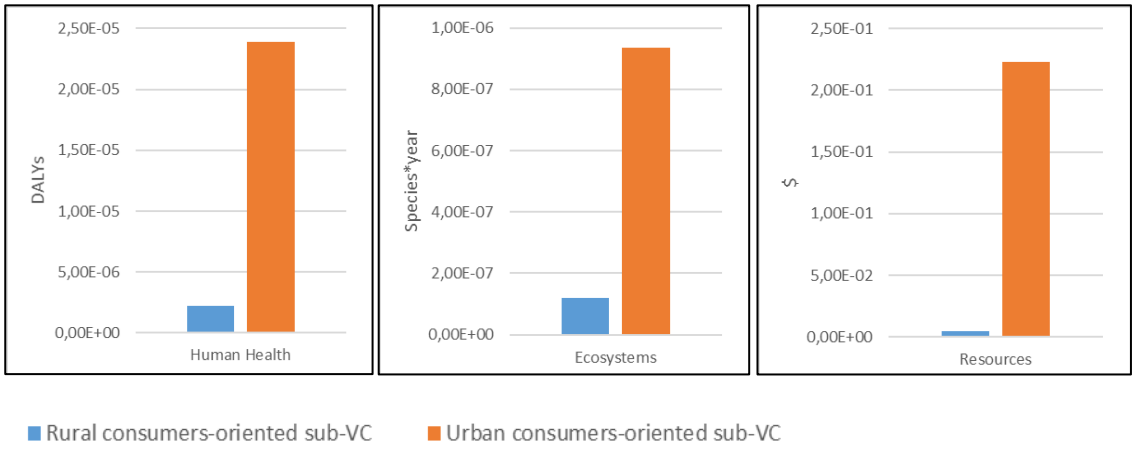


FIGURE 53: IMPACTS ON THE THREE AREAS OF PROTECTION FOR THE TWO SUB-VC IDENTIFIED IN THE ZIMBABWEAN BEEF VC: THE RURAL CONSUMERS-ORIENTED AND THE URBAN CONSUMERS-ORIENTED (IN UNIT PER KG OF EQUIVALENT BEEF CARCASS)

5.5.3 Cradle-to-farm gate: Comparison between beef production systems

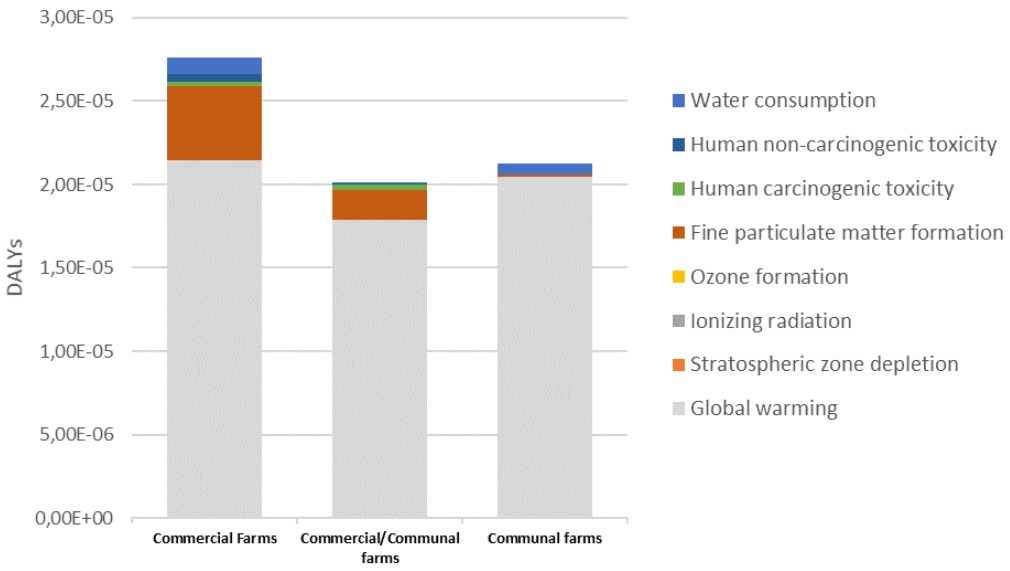
The impact of the three different beef production systems (communal, communal / commercial and commercial) on the three areas of protection is presented on Figure 53.

Impacts on Human Health is close for the different production systems although slightly higher for commercial beef production systems (2.76E-5 DALYs per kg equivalent beef carcass), due to fine particulate matter formation resulting from higher fossil energy use followed by communal (2.12E-5) and communal / commercial beef production systems (2.01E-5). As a consequence of GHG emissions, global warming is the main contributor in the three production systems followed by fine particulate matter formation due to fuel consumption in commercial and communal/commercial beef production systems.

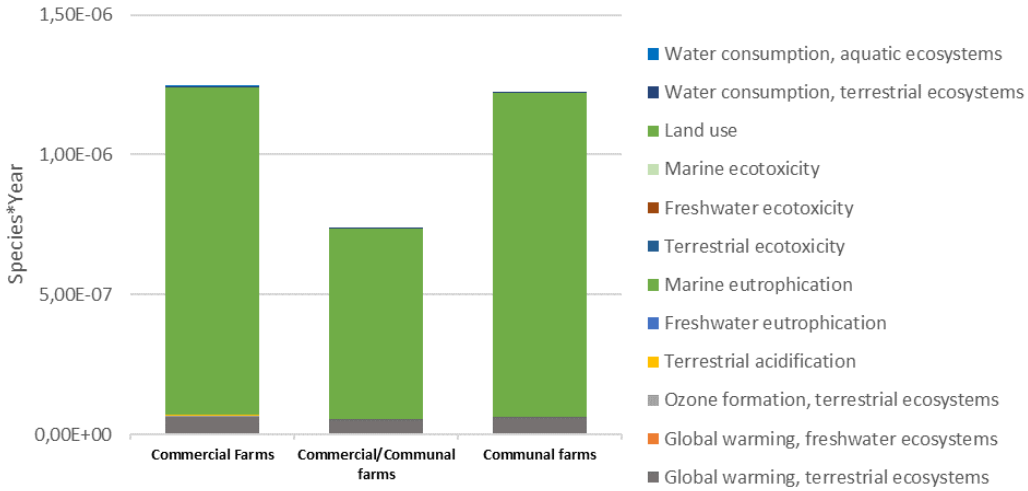
Concerning ecosystem quality impacts from communal and commercial production systems are close (respectively 1.22E-6 and 1.25E-6 species.year-1 per kg of equivalent beef carcass) mainly due to higher natural pasture area use for animal grazing. Impacts from commercial / communal farms is lower (7.37E-7 species.year-1 per kg of equivalent beef carcass).

Finally, Resources depletion is higher for commercial production systems ($0.29 per kg of equivalent beef carcass) compared to commercial / communal ($0.07) and communal production systems ($0.01). As fossil depletion represents 97% of the resources impacts, this illustrates the higher use of fossil energy both directly on farms and indirectly to produce inputs used by the farms.

(a)


3,00E-05
2,50E-05
2,00E-05
1,50E-05
1,00E-05
5,00E-06
0,00E+00
DALYs
Commercial Farms
Commercial/Communal farms
Communal farms
Water consumption
Human non-carcinogenic toxicity
Human carcinogenic toxicity
Fine particulate matter formation
Ozone formation
Ionizing radiation
Stratospheric zone depletion
Global warming

(b)


1,50E-06
1,00E-06
5,00E-07
0,00E+00
Species*Year
Commercial Farms
Commercial/Communal farms
Communal farms
Water consumption, aquatic ecosystems
Water consumption, terrestrial ecosystems
Land use
Marine ecotoxicity
Freshwater ecotoxicity
Terrestrial ecotoxicity
Marine eutrophication
Freshwater eutrophication
Terrestrial acidification
Ozone formation, terrestrial ecosystems
Global warming, freshwater ecosystems
Global warming, terrestrial ecosystems

(c)

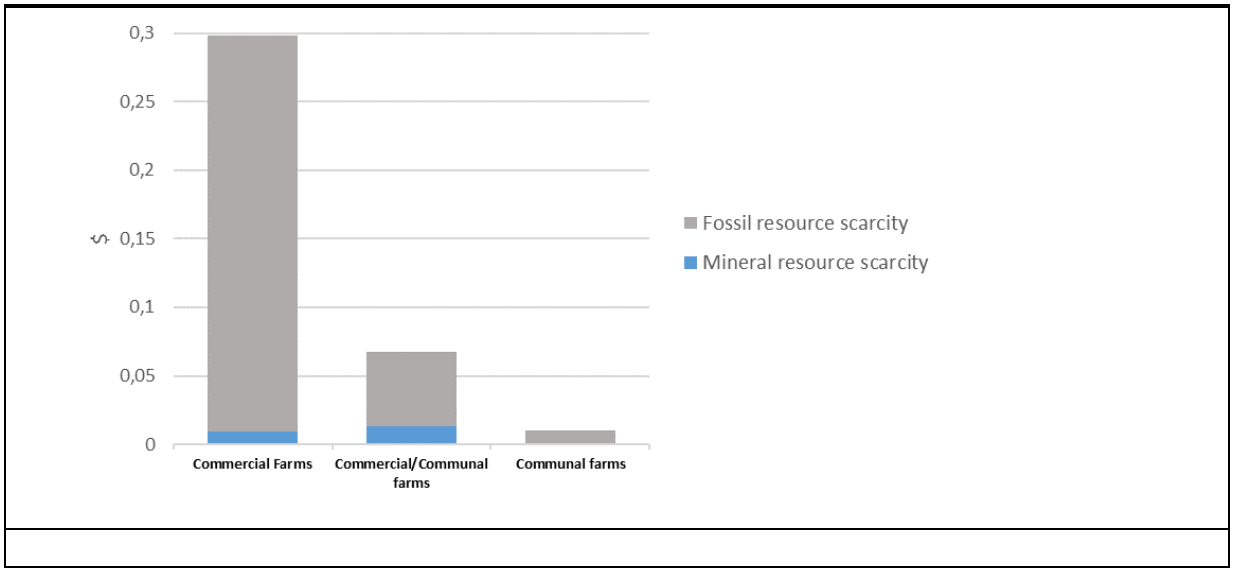


FIGURE 54: CONTRIBUTION OF THE DIFFERENT IMPACT CATEGORIES TO ENDPOINT RESULTS FOR 1KG OF EQUIVALENT BEEF CARCASS IN THE DIFFERENT FARMING SYSTEMS – (A) HUMAN HEALTH; (B) ECOSYSTEM QUALITY; (C) RESOURCES DEPLETION

Regarding the GHG emissions for the different beef production systems (Figure 54), the commercial production systems emits slightly more GHG (19.4 kg eqCO2 per kg eq beef carcass) than the two other production systems which are close (18.1 for commercial / communal and 11.2 for commercial production systems). For all the production systems, CH4 is the main emitted GHG (ranging from 82 to 99%). This share is representative of extensive production systems with grazing management and low inputs consumption. Indeed, in livestock production systems, CO2 emissions result mainly from both inputs fabrication and transportation and direct fossil energy use on farms while N2O results from fertilizer application.

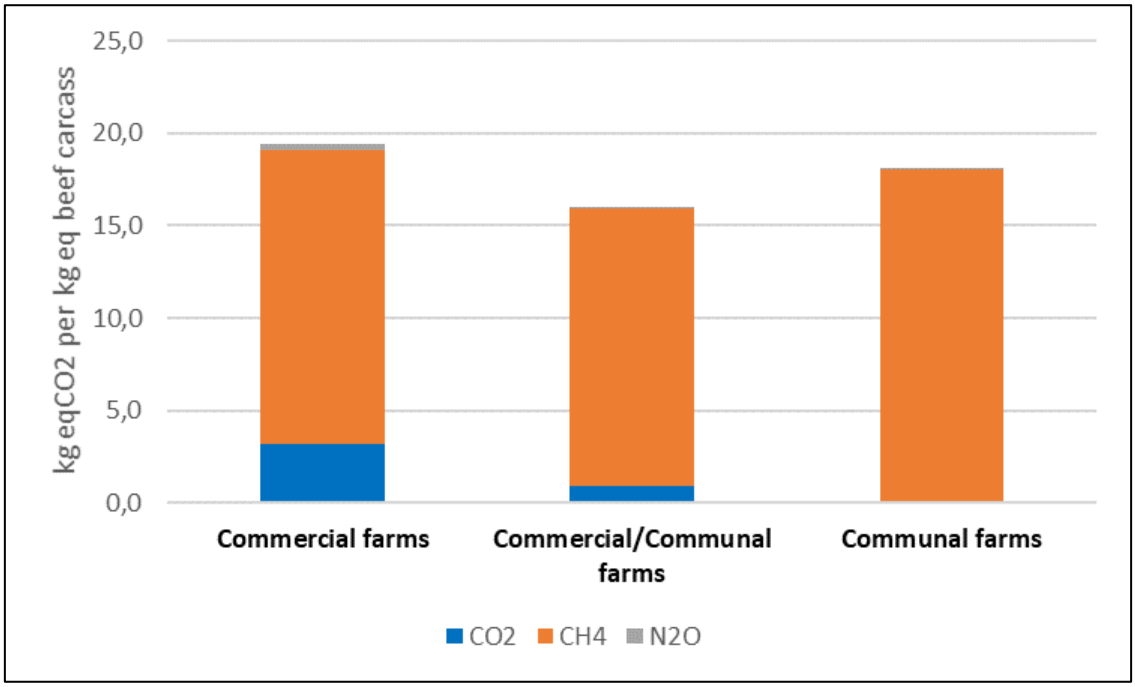


FIGURE 55: CONTRIBUTION OF THE DIFFERENT GHG TO GLOBAL GHG EMISSIONS OF THE THREE DIFFERENT BEEF PRODUCTION SYSTEMS

5.6 Environmental Analysis - Discussions and Conclusions

Answering the question "is the Zimbabwean VC sustainable?" is difficult because LCA indicators are not binary. There are no threshold values for the different areas of protection that enable us to say if the VC is or not sustainable. A possibility to answer this question is to compare obtained values with other references. Numerous studies have focused on environmental impacts of beef production around the world (Haas et al., 2000; Casey and Holden, 2006; Williams et al., 2006; Ogino et al., 2007; de Vries and de Boer, 2010; Veysset et al., 2010). Comparing results from different studies is always difficult due to differences in goal and scope and methods used. For instance, Ogino et al. (2007) applied LCA on beef Japanese production systems but use "one beef calf" as a functional unit while Haas et al. (2000) propose only a "cradle-to-farm gate" assessment. However, they offer a relevant way to position the VC sustainability.

Concerning Human Health damage, the most part of LCA studies present Midpoint indicators such as Global Warming Potential (GWP = Climate change) in kg CO2-eq. Gerber et al. (2013) proposed a global LCA approach to estimate GHG emissions for meat production in different part of the world. They conclude GHG emissions for beef production could range from around 15 to 75 kg eqCO2 per kg equivalent carcass. Considering this range, we can consider GHG emissions from Zimbabwean beef production systems are low. As a consequence and as the global warming is the main contributor to damage on Human Health from Zimbabwean beef VC, we can consider the VC have low impacts on this area of protection.

Concerning impacts on Ecosystem quality, we saw that the main contributor is land use, mainly due to large natural pasture area used by communal production systems. Unsustainability of this land use can be discussed. LCA in Endpoint ReCiPe 2016 method focused on two different types of land use: transformation (land use change) in which transformation refers to changing one kind of land cover to another, and occupation (land use) which refers to the use of a land cover for a certain period. Incorporating both types of land use in an assessment is important for full analysis, but considerable difficulties persist in the interpretation and combination of the two classes (Mattila et al., 2011). As such areas are natural, our assessment refers to occupation. However, unsustainability of this land use can be questioned. Firstly, valorization of these areas does not compete with other uses, as human food production for instance. Moreover, management of the natural pasture areas by communal farmers is extensive with low animal density. Sustainability of such management (overgrazing for instance) have not been assessed but, from interviews and as they represent their only feeding resources, communal areas management by farmers tend to be sustainable. Paradoxically, natural pasture areas management by commercial and commercial / communal farmers through fencing, both for veterinary control (e.g., veterinary cordons) and land appropriation, is more questionable. As demonstrated in South Africa, fences could be unselective and can create substantial physical barriers for many wildlife species (Gadd, 2012). The ecological cost of fencing is not considered in the LCA framework although it could represent a major burden in Zimbabwe.

Finally, contribution of the resource depletion is mainly caused by fossil energy use. Fossil energy use from cradle-to-market reached 5.8MJ per kg eq carcass. In literature, values for cradle-to-farm gate beef studies can range from 5 in Brazilian context (Cederberg et al., 2009) to more than 30MJ.kg

in Europe (Williams et al., 2006; Veysset et al., 2010) or still United States (Rotz et al., 2015). We could conclude that Zimbabwean beef VC is sustainable concerning Resources depletion. However, impacts accounting on water depletion is weak for Endpoint ReCiPe method because it is not contextualised. A method built by Pfister et al (2011) or the AWARE method (Boulay et al., 2018) are available for water deprivation. However, considering uncertainty on data both for water use and contextualized water scarcity in Zimbabwe, we decided not to apply it.

Despite the uncertainty inherent to our methods and data, we trust that the orders of magnitude of the impacts evaluated in this study and the key contributors identified are robust.

As a conclusion and regarding the indicators calculated, the impacts of Zimbabwean beef VC seems to be low comparing to a large part of beef VC investigated around the world. However, these low impacts are partly related to extensive and low-input management of communal production systems (Figure 55) for different reasons. Firstly, they present lower impacts on the different areas of protection with the exception of ecosystem quality. Secondly, they represent around half of carcasses produced yearly (51%). Finally, because carcasses from communal farmers are mainly sent in a direct sub-VC with only rural butchers as intermediate actors.

FIGURE 56: EXTENSIVE HERD MANAGEMENT IN COMMUNAL PRODUCTION SYSTEMS IN ZIMBABWE
Photo credit: Muriel Figuié

Nonetheless, we have seen this analysis could be completed at least by investigations dealing with: (i) direct interactions between beef production systems and wildlife; and, (ii) impacts of production systems on water depletion. The characterisation of production systems was simplified in this analysis. These additional investigations should more precisely address the diversity of production systems in the different parts of the country as they could represent diversified stakes according to the area.

6. SYNTHESIS AND RECOMMENDATIONS

6.1 Introduction and background

Conducted between September 2017 and April 2018, this analysis of the Zimbabwe beef value chain addressed the questions: what is the contribution of the value chain to economic growth; is the economic growth generated by the value chain inclusive; is the value chain socially sustainable; and, is the value chain environmentally sustainable.

The work was conducted through four analytical domains using a series of quantitative and qualitative research methods. First a functional analysis was conducted to map the value chain and its actors. Then an economic analysis was completed using the Afri-Food Value Chain Analysis (AFA) software. A social analysis was undertaken addressing social conditions and relationships. Finally, an environmental analysis was conducted using Life Cycle Assessment.

The historical background for the Zimbabwe beef value chain is important as it provides context for the current situation. Five periods of development were identified from pre-colonial to the current situation. During the colonial and post-colonial period the key objective for the beef sector was intensive commercial farming and exploitation of market access opportunities under the Lome Convention. Following this Zimbabwe underwent a period of intensive land reform with large-scale transfer of farm land from Commercial (white) farmers to small-scale (black) farmers. Somewhere between 161,500 and 300,000 households have resettled on about 4.9 million hectares (Scoones et al, 2010). Commercial farms (white) have declined from 4,000 to about 725. However, various categories of 'new' (black) commercial farms have been developed pre-and post-land reform (11,000 households). During this period the national disease control system failed and exports ended. Causes of this collapse include: co-habitation of buffalo and cattle; and, un-restrained movement of cattle from high-risk areas. Illegal exports and imports are also reported.

Currently, Zimbabwe aims to reinstate centralised veterinary control to manage transboundary diseases. This has, so far, been unsuccessful with regular outbreaks of food-and-mouth disease occurring, including during the period of this research.

A high proportion of the Zimbabwe population is poor (72.3%) and extremely poor (16.2%). Malnutrition affects 33.8% of children between 6-59 months of age. Rural Zimbabwe is poorer than urban areas by some margin (30.4% of households are extremely poor in rural areas vs 5.6% in urban areas). This drives migration and emigration. Livestock are essential for resilience and coping; cattle holding and maize yields closely correlated. Farms without livestock are the most vulnerable.

Beef consumption is declining: from 13kg to 4 or 6kg per capita reflecting income changes and the availability of cheap chicken meat.

Zimbabwe is a semi-arid country with 85% of the area receiving less than 800mm of rain a year. Resource endowment is high, but distribution skewed and sustainability is questioned by many. Key environmental issues include: land degradation, largely through poor land management;

deforestation, through land clearance and fuel use; water scarcity, due to over extraction and urbanisation; pollution of water and air, through mining, urbanisation and intensive agriculture; biodiversity loss, through agricultural expansion and habitat loss; and, climate change and variability, resulting in higher temperatures and lower/variable rainfall.

6.2 Operations of the Value Chain

Broadly speaking beef is produced in Zimbabwe under three farming systems (Table 50).

Farming system	Farmer type	Description/farmer type	No. of households	%	Land area (Ha million)	%	Size (Ha)
Fully Communal	Communal	Subsistence mixed farmer with using shared communal grazing and few purchased inputs. Animals for draft power, manure, milk, savings and status.	527,104	75.9	16.4	54.6	31
Partially communal/commercial	Old resettlement A1 Small A2	A range of relocated farmers using communal grazing and limited intensive production techniques. Animals for both communal and commercial uses including sales.	149,106	21.5	8.9	29.8	60
Fully Commercial	Old small scale commercial Large A2 Commercial	Semi intensive commercial production with supplementary feeding on enclosed land. Animals for sale for commercial gain.	17,700	2.6	4.7	15.6	266
Total			693,910	100	30	100	

TABLE 50: SUMMARY OF ZIMBABWE BEEF FARMING SYSTEMS USED IN THE ANALYSIS

The current beef cattle herd is estimated to be around 5.5 million head (figures are uncertain). The largest proportion of the national beef cattle herd is farmed on a relatively small scale and using a communal farming system, with emerging commercial and fully commercial farmers representing 22% and 6% of the cattle population respectively. An important proportion of communal and partially communal/commercial farmers have no livestock.

In the majority of beef production systems, off-take has declined (reflecting increased risk aversion, increased draft use, need for organic fertilizer, milk use and savings through animal holding), and, average animal size fallen (reflecting a return to more traditional breeds). Average carcass weight of animals slaughtered has declined from 200kg/animal to 167kg/animal as animals are kept longer and traditional breeds increase. Weaning rates have also declined.

Off-take rates are disputed in Zimbabwe, but 11% for commercial and 5% for communal are regularly cited. Challenges facing farmers selling cattle include: high formal and informal levies, duties and rents; and, endemic stock theft. A proportion of the national herd is informally slaughtered, although this figure is in dispute. Production is constrained by these and other

systemic issues including: poor access to extension services and advice; lack of resources for basic disease and parasite management; inadequate water supply for cattle in rural areas; and, inadequate animal nutrition, particularly licks and micro-nutrients.

Pre-production actors include input suppliers: feed manufacturers, veterinary medicine sellers/agrodealers, veterinarians/animal health workers and breeders. For the majority of farmers, these actors currently play a somewhat diminished role as few inputs are purchased. Vaccines and dips are the most important. Ratios of animal health workers to cattle owners are very low (e.g., 1 animal health worker to 700 farms in Chiredzi).

Cattle leaving farms is either slaughtered locally for local use or transferred via middlemen or auctions to abattoirs. Traders play an important role in intermediating between abattoirs and farmers. Important recent changes in the abattoir sector include the decline of large scale abattoirs and the growth in 'toll' slaughtering where the abattoir does not take ownership of the animals. It is estimated that 62 medium to large abattoirs slaughter 70-75% of the national herd, but that there are over 160 abattoirs registered. Challenges faced by abattoirs include: throughput, most abattoirs are under-utilised; grading, sellers complain that the old grading system fails to compensate adequately for the reversion of the national beef herd to traditional breeds and carcass weight and quality as declined; utilisation of the 5th quarter, sellers complaining that price does not adequately compensate for this high value element; and, collapse of the hide export and domestic use reducing overall animal slaughter values.

Post slaughter meat is sold to retailers, butchers, caterers and meat processors. Zimbabwe has a small but well-established meat processing sector, largely making sausages, burgers and pies for local sale. Most meat is sold as mixed meat pieces through urban butchers, retail outlets, restaurants and door-to-door meat and meat product traders. Issues in this element of the value chain include: shortages and high costs of imported elements (e.g., packaging and casings), decline of demand from farm workers (although to some extent compensated by the increase of small scale mining operations in the country), and, the threat of informality (risk of under-cutting of formal meat sales by illegal trade with lower food safety standards).

In terms of governance and institutional frameworks, Zimbabwe has a full set of government and non-government bodies. Government structures still reflect the national objective of veterinary control and export orientation.

The Government of Zimbabwe has a National Livestock Development Policy and Programme which aims to support integration of small scale farmers into the formal market chain. Export sales and FMD control are not highlighted in this policy, but are the focus of the proposed "Command Livestock, Fisheries and Wildlife Program". This programme aims to return Zimbabwe to competitive export. As part of this a National Livestock Identification programme is proposed based on electronic RFID tags.

The functional analysis highlighted 10 value chain dysfunctions (this is not an exhaustive list – neither are these dysfunctions ranked).

- Undervaluation of animal benefits: considering only economic and not social/environmental benefits potentially distorts national policy by over-valuing commercial vs communal production practices.
- Grading practices favour improved animals and commercial farmers.
- Abattoir management practices capture the value of the 5th quarter.
- Traceability is inadequate and promotes illegal trading and theft.
- Prices are not transparent due to the lack of information systems.
- Absence of cash in the economy discourages trade and increases costs.
- Economic uncertainty reduces risk taking and encourages animal retention.
- Informal transaction, rent seeking and direct levies diminish investment and growth in the sector.
- Absence of disease management reduced the overall economic potential of the value chain.
- Drought management is very poor: particularly water access, stocking rates, supplementary feeding and grazing management.

6.3 Synthetic presentation of the analytical domains

6.3.1 Economic Analysis

A dynamic model of the Zimbabwe beef value chain was constructed using the AgriFood Chain Analysis Model (AFA). Challenges to developing this model included: data gaps; uncertain economic conditions (e.g., inflation) and currency value variability; high and unmeasured business costs; high taxes and levies; and the uncertainty of government intervention in the sector.

Financial analysis indicates that all three farming models are currently profitable and viable, with communal and partially communal/commercial systems using very few inputs from the wider economy. Both abattoirs and meat processors are viable with relatively high net profits. Other actors are also profitable, although middlemen were squeezed at the time of the analysis due to the high premium on cash over electronic transactions.

At the level of the national economy, total value added (contribution of the VC to GDP) is estimated at Z$432 million. Beef contributes 27% of the agricultural GDP. The VC's contribution to public finances is modest (0.5% of government earnings). Since there are currently no beef exports, the contribution of the VC to the trade deficit is Z$6million or 7% of total imports. Direct Value Added is generated mostly by producers (40%), followed by traders (34%) and processors (26%). A high proportion of the Total Value Added (91%) is generated by the VC actors. Integration into the domestic economy (total value added / total production) is, therefore high (0.87).

Sustainability within the global economy. The beef VC has a low social cost-benefit ratio (0.319) strongly suggesting comparative advantage and domestic allocative efficiency. With a Domestic Resource Cost Ration (DCR) of 0.101 the foreign exchange use of the beef value chain is very low and comparative advantage likely to be high.

Disaggregation of the AFA data into a policy analysis matrix suggests that current policies are reducing social profits in return for private profit, some of which is captured as tax.

In terms of the inclusiveness of growth, it is fair to say that traders and processors take a commanding proportion of VC income (48.5%), but it is also important to note that returns to family labour are not included in the analysis and are a major source of benefits and inclusiveness in any growth from this VC. The low level of consumption in the value chain reflects the low integration of communal farmers. Wages from the beef VC are relatively small and declining reflecting the overall structural move from formal to informal.

Employment and vulnerability. Direct employment in the beef value chain (excluding self-employment and temporary workers) is 121,604. This does not include family labour. We consider that the potential for job creation through upgrading farms from communal to different forms of partially and fully commercial is good and that additional horizontal and vertical integration can create employment where comparative advantage is shown. However, we caution that policies to create formal employment in beef production and processing can have a corollary in reducing economic space for family labour if market access is not universal (e.g., by increasing commercial farming models based on disease free status policies might limit market access for communal farmers or increase market access costs to such a degree as to impact on food security and resilience for this vulnerable group.

We conclude that the potential for the beef VC to contribute to the national economy is high. Integration also remains fairly high and potential for growth based on comparative advantage is also high.

6.3.2 Social analysis

The beef value chain is embedded in complex social issues, such as land tenure, food security, gender participation.

Major issues:
Land tenure reform, which was implemented without a consultation process, has been a transformative policy in relation to land reform, parks and wildlife management and territorial control of Foot and Mouth Disease. Land reform has given land rights to numerous families. However, it has led to land insecurity in relation to a lack of title deeds and lack of formal rent contracts. Proximity to conservancy areas increases the risk of wildlife conflicts and cattle losses; without a compensation scheme. This situation increases the risk and limits potential investments in cattle production.

The beef VC can contribute to increase food availability on the domestic market and accessibility (through income generated). Cattle also contribute to food accessibility in small scale farms by providing draft power and manure. In a context of very low dietary diversity and nutrient deficiency, cattle products (meat, milk) are essential to improve the nutritional status of the population. At the moment, there is strong competition from the poultry chain since chicken meat is more affordable. However, taking into account the economic and environmental performances of the beef VC (and considering what could be expect from other value chain), it should be considered as one of the priorities to improve national meat availability.

Cattle ownership supports the need for cash and live animals can be converted to money quickly and on demand. It supports children's education since paying school fees is one of its main functions. It contributes to household resilience in case of a shock or crisis (e.g., climatic and financial). The farmers encountered showed a high interest in investing in more commercial cattle farming activities, i.e. pen fattening activities, but are quite limited by their capacity to invest.

Cattle ownership and management is traditionally a male activity. The other stages of the beef value chain (slaughterhouse, feeding companies) mainly offer employment to men. Women have a minor role (except in relation to manure and milk) but those encountered declared an interest in cattle ownership and pen fattening activities. However, women have limited access (even no access) to the main means of building up a herd (e.g. herding, migration).

Most of the people engaged in cattle related activities are self-employed communal farmers and their families. Cattle ownership increases work productivity (ploughing, seeding, transport…). Children (boys and girls), as family members, may be involved in herding and milking activities but this does not affect school attendance. In relation to employed workers, they have a weak position in the value chain: lack of freedom of association, importance of casual work, and lack of formal contracts. Nevertheless, the working conditions are relatively good compared to other production sectors (e.g., sugar cane plantations), in particular in large-scale abattoirs in relation to occupational health and safety due to a strong legislative framework.

The whole VC is characterized by a lack of trustworthy relations. Farmers are poorly organized and poorly represented in decision bodies; they lack market information, and their bargaining power is low. Nevertheless, farmers have been able to resist different successive policies that have ignored the complex role of cattle in rural livelihoods. They have proven their capacity to equip the farms resulting from the fast track land reform with draft power, to occupy part of the economic space released by the dismantlement of large-scale livestock farms, and to adapt to a highly variable and uncertain context.

Risk/cost of non-intervention vs benefits:

The value chain is more inclusive than it was in the past. But, in the present context (cattle farmers with low bargaining power; lack of stakeholders' consultation, current policies and discourses contributing to discredit cattle multi-functionality and farmers' rationalities), non-intervention could jeopardize this inclusiveness.

There is a risk that the multifunctionality of cattle at farms level might be jeopardized by some national policies highly focused on beef as a commodity. For example, the potential increase in cattle off-take (10% at the moment) should not affect the access to draught power for all those rural households with no cattle (around 50 %, probably mainly female-headed households).

Extension services directed to livestock are highly focused on cattle and health issues. Means are lacking (in particular for the functioning of the dip tanks) and high attention is given to FMD control. There is a strong risk that investments in the restoration of a FMD fence will be made without taking

into account the "new" land use and users (compared to the period before the land reform). It could contribute to restore a dualistic animal farming system with limited inclusiveness.

The development of the value chain beef VC could bring competition to female livestock activities (small ruminants, poultry). Without external support it is likely that women will not participate and could be side-lined from decisions that might impact their activities. The development of the beef VC chain can nevertheless bring them opportunities, as a new source of income. Projects conducted by NGOs, such as pen fattening projects, help to reduce this discrimination since the inclusion of women is one of their priorities.

6.3.3 Environmental analysis

An environmental assessment of the Zimbabwean beef value-chain (VC) has been performed in the framework of the European Union Value Chain Analysis for Development (VCA4D) project. The main question asked by the EU is: “Is the Zimbabwean beef VC environmentally sustainable?”

The environmental sustainability of the Zimbabwean beef VC was evaluated from a cradle-to-farm-gate perspective using 1 kg equivalent carcasses of beef available for the consumers as a functional unit. Primary data have been harvested during field visits, later by the local team of experts or from the literature. They concern all inputs and outputs (yield and rejects) for different types of processes involved in the VC: feed concentrates production, agricultural production (one maize cropping system and three beef production systems: Communal, Communal / Partially Commercial and Commercial production systems), slaughter (rural butchery and abattoir), transformation (meat processors plant) and retailing (catering, urban butchery and informal retailing). Overall, the data collected constituted a reasonably reliable dataset with a Data Quality Index of 2.9, corresponding to “basic quality”.

The LCA have been performed with the Simapro® software (version 8.3.0.0). For background processes, three consistent inventory databases were used: Ecoinvent 3 (Alloc Rec), Agri-footprint (economic allocation) and Agribalyse (v1.3). The Endpoint ReCiPe 2016 method (Hierarchist) was used to calculate the impacts to produce an answer for each of the three areas of protection.

Cradle-to-market assessment shows that each area of protection is mainly related to one impact category: Global warming for Human health, Land use for Ecosystem conservation and Fossil energy use for Resources depletion. These impacts occur mainly at farming production systems stage where they represent from 73 to 100% of the endpoints damage according to the area of protection.

Cradle-to-farm-gate assessment shows different impact contributions from the different beef production systems. While the three production systems contributed around equally to global warming, land use is mainly represented by communal production systems and fossil energy use by commercial production systems. Moreover, impact of commercial production systems is larger compared to communal production systems. This results in a larger impact for 1 kg of equivalent beef carcass available for urban consumers than for rural consumers as the latter is mainly based on carcasses from communal production systems.

Regarding the results obtained in other contexts and comparing to literature, the Zimbabwean beef value chain could appear sustainable. However, further in-depth investigation would seem warranted to confirm this finding. Such further research should focus on the impact of natural pasture area management, especially fencing, on wildlife or water use on water depletion.

Dynamics of the development of the VC

To collate the results of the various value chain analysis the Team has applied two synoptic tools, a risk analysis matrix and a Strength, Weakness, Opportunities and Threats (SWOT) matrix (see Table 51 and Figure 57).

Risk category	Comments	Relevant indicators	Probability	Severity
Price trends	Inflationary pressure in Zimbabwe is currently very high	Retail Price Index (%)	High	High
Price volatility	Potential for over and under supply caused by climate variability	Total animal slaughter (heads/year)	High	Medium
Logistics and infrastructure	Domestic infrastructure good but in decline		Medium	Medium
Policies	Command livestock distorts domestic beef economy	Ratio of beef sales price per hear vs border parity price	Medium	High
Social relations	Reduced livestock ownership in rural areas increases vulnerability and reduced resilience	No. of households with >5 head cattle	Medium	High
Food safety and phytosanitary situation	Unregulated veterinary disease	No. of outbreaks (tick borne diseases, FMD) incidents reported per year	High	Medium
Weather and climate change	Increased average temperature, reduced and variable rainfall	Rainfall and temperature statistics	High	High
Natural environment	Land degradation, pollution, forest clearance, water resources depletion, GHG emissions	Agricultural land occupation (ha), deforestation rates (ha/yr), water depletion (water use / water resources depletion), Annual livestock sector GHG emissions assessment	Medium	Medium

TABLE 51: RISK ANALYSIS MATRIX FOR THE ZIMBABWE BEEF VALUE CHAIN

	Positive	Negative
Internal	Strengths: • Comparative advantage in beef production • Existing infrastructure • Low environmental impacts due to extensive management • Cattle ownership and livestock management is an important source of climate resilience against the negative impacts of climate shock, particularly for communal farming systems.	Weaknesses: • Inadequate access to capital • Infrastructure mainly in former commercial areas • Low level of cattle producers' organisations • Failure to control animal diseases with high mortality threatens cattle productivity •
External	Opportunities: • High potential for intensification • Processing and export of beef and beef products (hides) • Strong potential for vertical integration	Threats: • Failure to control trans-boundary disease threatens trade • Wildlife predation • Alternative cheap animal protein (chicken) • Continued economic uncertainty discourages investment • Low consumers' purchasing power

FIGURE 57: SWOT ANALYSIS OF THE ZIMBABWE BEEF VALUE CHAIN

6.4 Recommendations

The Team offers recommendations in four areas as follows:

- Deepening the knowledge on the VC by filling in important information gaps, e.g. technological or management diagnosis at a specific stage of the chain;

Whilst the Zimbabwe beef VCA has been fairly comprehensive, it is based on a rather weak national animal production data set, particularly for communal farming systems and for households without animals. Greater knowledge of these two groups would strengthen the inclusiveness of future policy decisions.

- Enhancing the development of the VC;

Development of the beef value chain is at an important crossroads. The analysis suggests that investment in measures to enhance market access can release significant comparative advantage. However, the inclusiveness of this approach is questionable. The risk is that, by investing resources in veterinary control, those (in the great majority) who either have few animals which are un-traded or who have no animals (but wish to own animals) will effectively pay the cost of market access by transfer from one sector to another.

We would, therefore, strongly recommend a development of the sector that aims a) to be inclusive, b) to encourage an increase in the number of emerging commercial producers, and, c) promotes livestock ownership and a means for non-owning households to generate income and increase

resilience. A nuanced beef sector development strategy will be needed to prevent rent seeking and unexpected negative impacts from transfers from one group to another.

- Avoiding major risks (as identified in the risk analysis);

The potential for downside risk is high in the beef value chain. We particularly note that Zimbabwe is highly likely to suffer the negative impacts of climate change. Cattle ownership and livestock management in general is an important source of climate resilience against the negative impacts of climate shock, particularly for communal farming systems. Moreover, moving towards more intensified production systems as commercial farms could not be without increasing environmental impacts especially on resources depletion (fossil and water) and GHG emissions.

Economic uncertainty is an important and, currently, highly likely risk for the beef sector. Ownership of cattle as a hedge against such uncertainty is a strong driver of reduced off-take.

At the moment, the risk that uncertain policies might negatively impact on a high proportion of the beef value chain is present. We recommend that careful analysis is conducted (possibly using the AFA methodology) to ascertain the potential impacts of policies before they are implemented.

- Possible follow-up work to be undertaken within the framework of the Agrinatura partnership.

The Zimbabwe beef value chain analysis provides an empirical tool and measure against which future investments in the sector can be measured. We strongly recommend that the analysis be re-done after a period of time to assess the impact of policies and investments.

Annex 1: Team itinerary

1st Mission: 16-28 October 2017

Arrival in Zimbabwe

15th October	Muriel and Mathieu arrive in Harare
16th October	Ben arrives @12.15 hrs SA022

DAY 1 – Monday 16th October

14.00 – 16.00	Team meeting and briefing on logistics @ Bronte Hotel

DAY 2 – Tuesday 17th October

08:30 – 10:30	Briefing Meeting with EUD Zimbabwe – Anton + Martin and Thomas
11.00 – 13.00	**Livestock and Meat Advisory Council – Briefing on Zimbabwe Beef Industry**
13.00 - 14.00	*Lunch*
14.15 – 15.00	**Department Livestock and Veterinary Services (DLVS), Ministry of Agriculture**
15.15 – 16.00	**Division of Livestock Production and Development (DLPD),**
16.15 – 17.00	**Department of Research & Specialist Services (DR&SS)**

DAY 3 – Wednesday 18th October

09.45 – 10.30	**Grain Marketing Board – Mr. R. Mutenha/Mr. L. Jasi**
12.15 – 13.15	**Stockfeeds Manufacturers Association (SMA)**
13.15 – 14.00	*Lunch*
14.00 – 14.45	**Commercial Farmers' Union (CFU) + Cattle Producers' Association (CPA)**
15.00 – 16.00	**CC Sales/Nurture Finance Company**

DAY 4 – Thursday 19th October

08:30 – 09:30	**Zimbabwe Statistics (Zim-Stats)**
09.45 – 10.30	**Veterinary supplies - Vet Distributors,**
11.00 - 12.00	**Centre for Applied Social Studies (CASS) – University of Zimbabwe**
12.15 – 13.15	**Institute of Environmental Studies – University of Zimbabwe**
13.15 – 14.15	*Lunch*
14.15 – 14.45	**USAID Feed-the-Future Zimbabwe Livestock Development Project**
16.00 – 17.00	**MAMID Department of Economics & Markets**

DAY 5 – Friday 20th October

06:30 – 08:30	**Travel to and tour Binder Abattoir, Goromonzi**
09.00 – 11.00	**Meeting at Surrey Abattoir and Feedlot**
12.30 – 13.30	*Lunch*
13.15 – 14.30	**Tour of smallholder beef farm, Murehwa District**
16.00-17.30	**Meeting at UN Food and Agricultural Organization –,and team**

DAY 6 – Saturday 21st October

08.30 – 12.00	**Tour of commercial beef f**

DAY 7 – Sunday 22nd October

14.30 – 15:00	Travel to Harare Airport

16.00 – 17.00	Harare – Bulawayo
18.00	Overnight in Bulawayo –Bulawayo Club

DAY 8 – Monday 23rd October

10:00 – 12:30	**Meeting with Cold Storage Company (CSC) Bulawayo –**
12.30 – 13.30	**Visit to a private butcher – Bulawayo Meat Market**
13.30 – 14.00	*Lunch*
14.00 – 15.00	**Sunset Marketing (Stockfeeds), 88 Plumtree Rd, Bulawayo.**

DAY 9 – Tuesday 24th October

08:30 – 09:30	**Amalima/Orap USAID Feed-the-Future Agricultural Development Project**
09.45 – 10.30	**Centre for Rural Development –(provided documents)**
12.00 – 13.15	*Lunch*
14.00 – 16.00	**Matopos Research Station Institute, DR&SS, Bulawayo**

DAY 10 – Wednesday 25th October

07.30 – 14.00	**Tour of smallholder beef farms in Nyamandlovu District, Matabeleland North**
12.30 – 14.00	*Lunch*
17.00 – 17.30	Travel to Bulawayo Airport
20.00 – 21.15	Bulawayo to Harare

DAY 11 – Thursday 26th October

0830 - 0915	**Zimbabwe Farmers' Union**
10:00 – 12:30	**Debriefing at EU Delegation Zimbabwe**
12.30 – 14.15	***Lunch***
15.00	Ben Bennett departs

DAY 12 – Friday 27th October

09:30 – 10:30	Mathiue Vigne + Muriel Figue Depart

Second Mission to Zimbabwe by Prof Ben Bennett: 21 January-1 February 2018

22 Jan 2018	**Prof Ben Bennett arrives in Zimbabwe**
23 Jan 2018	**Meeting at EU Delegation in Zimbabwe – Agriculture Private Sector + Trade**
24 Jan 2018	**Meeting with a transporters**
25 Jan 2018	**Livestock and Meat Advisory Council (LMAC)**
26 Jan 2018	**Associated Meat Packers – Meat processors and wholesalers**
26 Jan 2018	**MC Meats – Abattoir and wholesaler**
26 Jan 2018	**Meat Processors Association of Zimbabwe (MPAZ)**
27 Jan 2018	**Commercial Cattle Farmer**
29 Jan 2018	**Communal Beef Farmer – Goromonzi District**
31 Jan 2018	**EU Delegation in Zimbabwe – Agriculture Private Sector + Trade**

	Dr Muriel Figue – 2nd Mission to Zimbabwe, 7 to 17 February 2018
8 Feb 2018	**GAPWUZ**
8 Feb 2018	**NEC Agriculture**
9 Feb 2018	**Zimbabwe National Farmers' Union (ZNFU)**
9 Feb 2018	**DAI – Zimbabwe Agricultural Growth Programme (ZAGP)**

12 Feb 2018	**Chiredzi District Veterinary Office**
12 Feb 2018	**Chiredzi District Administrator's Office**
12 Feb 2018	**Muteyo Animal Health Management Centre – Chiredzi (45 farmers, 15 females)**
13 Feb 2018	**Chiredzi Rural District Council (RDC)**
13 Feb 2018	**Rupangwana Feedlot and ISAL Group -**
14 Feb 2018	**Sabie Meats – Abattoir + Wholesaler**
14 Feb 2018	**Muko Butchery + Slaughter Pole**
14 Feb 2018	Koala Abattoir + Meat Wholesalers
15 Feb 2018	**District Medical Officer - Chiredzi**
15 Feb 2018	**Middleman/Cattle Aggregator - Chiredzi**
15 Feb 2018	**Nandi Primary School – Chiredzi**

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Annex 3: List of acronyms used

ACP-EU	African, Caribbean and Pacific – European Union
AFA	AfgriFood chain Analysis
AHI	Animal Health Inspector
AHW	Animal Health Worker
AMA	Agricultural Marketing Authority
C	Completeness
CAADP	Comprehensive Africa Agricultural Development Program
CAP	Credit Against Poverty
CBAHW	Community Based Animal Health Worker
CBT	Commodity based trade
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CFU	Commercial Farmers Union
CH_4	Methane
CO_2	Carbon dioxide
CSC	Cold Storage Company
DALY	Disability Adjusted Life Years
DEVCO	International Cooperation and Development
DfID	Department for International Development, UK
DLVS	Department of Livestock and Veterinary Services
DRSS	Department of Research and Specialist Services
DQR	Data Quality Rating
EC	Employment Council (known previously as NEC, National Employment Council)
EC AI	Employment Council for Agricultural Industry of Zimbabwe
EEA	European Environment Agency
EMEP	European Monitoring and Evaluation Programme
ENDA	Dondolo Mudonzvo, Environment and Development Activities
EPC	Effective Protection Coefficient
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FMD	Foot and Mouth Disease
FOFU	Federation of Farmers Unions
FPL	Food Poverty Line
GAPWUZ	General Agriculture and Plantation Workers' Union of Zimbabwe
GDP	Gross Domestic Product
GeR	Geographical representativeness
GII	Gender Inequality Index
GMB	Grain Marketing Board
GoZ	Government of Zimbabwe
Ha	Hectare
HDI	Human Development Index
HGAPWUZ	Horticulture, General Agriculture and Plantation Workers' Union of Zimbabwe
IC	Intermediate Consumption
ICCPR	International Covenant on Civil and Political Rights
ICESCR	International Covenant on Economic, Social and Cultural Rights
ILO	International Labour Organisation
IPCC	Intergovernmental Panel on Climate Change
IPEC	International Programme on the Elimination of Child Labour
ISO	International Organization for Standardization
ITUC	International Trade Union Confederation
Kg	Kilogram
kWh	Kilowatt hour
L	Litre
LCA	Life Cycle Analysis
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
LMAC	Livestock and Meat Advisory Council
m	metre
M	Methodological appropriateness and consistency
MAMID	Ministry of Agriculture, Mechanization and Irrigation Development

MDG	Millennium Development Goals
m^2	Square metre
m^3	Cubic metre
ml	Mililitre
MLARR	Ministry of Lands, Agriculture and Rural Resettlement
MJ	Megajoule
Mt	Metric ton
N_2O	Nitrous oxide
NASCUZ	National Association of Cooperative Savings and Credit Unions of Zimbabwe
nb	Number
NGO	Non- Governmental Organization
NH_3	Ammonia
NO	Nitric oxide
NSA	National Security Authority
OECD	Organisation for Economic Co-operation and Development
OHS	Occupational Health Services
OIE	World Organisation for Animal Health
ORAP	Organization of Rural Associations for Progress
P	Precision and uncertainty
PAM	Policy Analysis Matrix
PICES	Poverty, Income, Consumption and Expenditure Survey
PWLMA	Park and Wildlife Management Authorities
RDC	Rural Development Council
SADC	Southern African Development Community
SI	Statutory Instrument
SIGI	Social Institution and Gender Index
TCPL	Total Consumption Poverty Line
TeR	Technological representativeness
TrR	Time-related representativeness
UNICEF	United Nations Children's Fund
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VA	Direct Value Added
VAT	Value Added Tax
VC	Value chain
VC4D	Value Chain Analysis for Development
VEA	Veterinary Extension Officer
VGGT	Voluntary Guidelines on the Responsible Governance of Tenure
yrs	Years
Z$	Zimbabwean dollar
ZAEO	Zimbabwe Agricultural Employers Organisation
ZAGP	Zimbabwe Agricultural Growth Programme
ZAIP	the Zimbabwe Agriculture Investment Plan
ZCFU	Zimbabwe Commercial Farmers Union
ZCTU	Zimbabwe Congress of Trade Unions
ZDHS	Zimbabwe Demographic and Health Survey
ZFU	Zimbabwe Farmers Union
ZimAsset	Zimbabwe Agenda for Sustainable Socio-Economic Transformation
ZIMVAC	Zimbabwe Vulnerability Assessment
ZRBF	Zimbabwe Resilience Building Fund
WFP	World Food Programme

Annex 4: Beef production models used in the AFA analysis

Assumtions	Unit	Option 1 Fully commercial	Option 2 Partially commercial/communal	Option 3 Fully communal
Description of farming system	Ha	Beef cattle farmer, started in 2002, cattle breeding for beef. Land area = 200 ha owned and 1,120 ha leased. Using a open grazing and supplementation system. Milk, unused. Manure, gifted.	Mixed cattle and arable farmer. Keeps cattle for own use (food, gift, savings, draft, manure, cash needs). Using a 'graze and kraal' sysem combining home farm with communal grazing. Generally using family labour.	Mixed cattle/livestock and crop farmer. Maize and other crops on 4 acres. Using only family labour. Keeping cattle for draft, manure and milk. Very limited offtake only when animal too old.
Breed/mix	Type	Mainly Brahman X, but moving towards pure Brahaman and also Simmental. Ultimately to cross Simbra.	Traditional un-improved breeds. Not buying cattle for stock improvement.	
Farm size	Ha	1320	3.5	1.6
Own		200		
Rented		1120		
Communal land area	Ha		35.5	Unknown

TABLE 52: OVERVIEW

Type of animal		Option 1 Fully commercial		Option 2 Partially communal/commercial		Option 3 Fully communal	
	Unit	No. of Animals	Livestock units	No. of Animals	Livestock units	No. of Animals	Livestock units
Mature cows	Head	290	290	14	14	2	2
Bulls	Head	14	17.5	2	2.2	0	0
Heifers >2 years	Head	85	85	13	13	2	2
Heifers - yearlings	Head	96	76.8	0	0	0	0
Steers >2 years	Head	76	76	2	2	2	1.6
Steers - yearlings	Head	4	3.2	0	0	1	0.7
Unweaned calf	Head	88	35.2	0	0	0	0
Weaned calf	Head	0	0	10	5	0	0
Cow and calf	Head	0	0	0	0	0	0
Total		653	583.7	41	36.2	7	6.3

TABLE 53: HERD COMPOSITION

Animal units*	Unit	Option 1 Fully comercial	Option 2 Partially commercial/communal	Option 3 Fully communal
Mature cows	Animal unit coefficient	1	1	1
Bulls	Animal unit coefficient	1.25	1.1	1.1
Heifers >2 years	Animal unit coefficient	1	1	1
Heifers - yearlings	Animal unit coefficient	0.8	0.8	0.8
Steers >2 years	Animal unit coefficient	1	1	0.8
Steers - yearlings	Animal unit coefficient	0.8	0.8	0.7
Unweaned calf	Animal unit coefficient	0.4	0.4	0.4
Weaned calf	Animal unit coefficient	0.5	0.5	0.5
Cow and calf	Animal unit coefficient	1.4	1.4	1.4

TABLE 54: ANIMAL UNIT COEFFICIENTS

* from Simpson, J (1988), The Economics of Livestock Systems in Developing Countries: Farm and Project Level Analysis, Westview Special Studies in Agricultural Science and Policy, Bolder, Colorado

Type of animal		Option 1 Fully commercial		Option 2 Partially communal/commercial		Option 3 Fully communal	
	Unit	No. of Animals	Livestock units	No. of Animals	Livestock units	No. of Animals	Livestock units
Herd growth							
Mature cows	Head	0	0	0	0	0	0
Bulls	Head	0	0	0	0	0	0
Heifers >2 years	Head	0	0.00	0	0	0	0
Heifers - yearlings	Head	0	0	0	0	0	0
Steers >2 years	Head	0	0	0	0	0	0
Steers - yearlings	Head	0	0	0	0	0	0
Weaned calf	Head	0	0	0	0	0	0
Unweaned calf	Head	0	0.00	0	0	0	0
Cow and calf	Head	0	0	0	0	0	0
Total herd growth	Head	0	0.00	0	0.00	0	0
Offtake							
Mature cows	Head	99	99	3.8	3.8	0.25	0.25
Bulls	Head	3	3.8	0.3	0.33	0	0
Heifers >2 years	Head	0	0	0	0	0	0
Heifers - yearlings	Head	0	0.0	0	0	0	0
Steers >2 years	Head	95	95	3.3	3.3	0.25	0.2
Steers - yearlings	Head	0	0	0	0	0	0
Weansed calf	Head	0	0	0	0	0	0
Unweaned calf	Head	0	0	0	0	0	0
Cow and calf	Head	0	0	0	0	0	0
Total offtake		197	198	7.4	7.43	0.5	0.45
Gift/consume							
Mature cows	Head	0	0	2	2	0	0
Bulls	Head	0	0	0	0	0	0
Heifers >2 years	Head	0	0	0	0	0	0
Heifers - yearlings	Head	0	0	0	0	0	0
Steers >2 years	Head	3	3	0	0	0	0
Steers - yearlings	Head	0	0	0	0	0	0
Weaned calf	Head	0	0	0	0	0	0
Unweaned calf	Head	0	0	0	0	0	0
Cow and calf	Head	0	0	0	0	0	0
Total		3	3	2	2	0	0

TABLE 55: OFF-TAKE MODEL

Production measures	Unit	Option 1 Fully commercial	Option 2 Partially commercial	Option 3 Fully communal
Calving rate	%	72.8	60	25
Survival rate - calves to weaners	%	95	92	90
Survival rate - weaners to >2 yr heifers	%	98	95	92
Annual herd growth	Animal unit	0.00	0	0
Average Farm size	Ha.	1,320	40	5
Fence length	Metres	25,171	2,530	40
Fence price	Z$/m	0.70	0.70	0.50
Average starting weight	Kg	300	275	250
Finishing weight	Kg	450	375	350
Feeding period	Days	90	0	0
Daily feed quantity	Kg	11.1	0	0
Dressing percentage	%	50	45	40
Sale price	Z$/kg live weight	2.2	2	2
Weaner sale price	Z$/head	400	350	350
>Heifer sale price	Z$/head	550	500	450
Water	L/head/year	300	0	0
Water pump fuel cost	Z$/litre	0.02	0	0
Milk production per mature cow	L/Year	270	360	180
Milk retained on farm	L/year	0	180	180
Manure production per livestock unit/day	Mt/day	0.025	0.02	0.02
Total manure production	Mt/year	5,326	264	51
Manure sold per year	%	5	5	0
Manure used directly on farm	Mt/year	5,060	251	2
Manure sold	Mt/year	266	13	-
Manure price	Z$/Mt delivered	5	5	5
Home consumption	Animal unit/year	3	2	0
Price of donkey cart and team	Z$/unit	350	350	350
Price of draft plough	Z$/unit	n/a	230	230
Diesel	Z$/litre	1.27	1.27	1.27
Tractor Km/litre of diesel	Km	10	10	0
Draft power	Z$/ha/year	0	65	50
Milk sale price	Z$/litre	0	1	1
Carcas permit fee for own slaughter	Z$/head	20	20	20

TABLE 56: ASSUMPTIONS USED IN THE ANALYSIS

Pay as you earn (PAYE)	Z$/month	0-300 = 0%-0
NSSA	Z$/month	3%
NEC contribution	Z$/month	Z$1
Union fees	Z$/month	3%

TABLE 57: TAXES AND DEDUCTIONS

	Unit		Notes
Size of farm	Ha	1,320	
No. of units on farm	Piece	3	
Size per unit	Ha	440	
Width of each unit	Metres	2,098	Square root of Ha.
Total length of fence/unit	Metres	8,390	
Total fence per farm	Metres	25,171	

TABLE 58: COMMERCIAL FARM FENCE COST MODEL

	Unit		Notes
Size of farm	Ha	40	
No. of units on farm	Piece	1	
Size per unit	Ha	40	
Width of each unit	Metres	632	Square root of Ha.
Total length of fence/unit	Metres	2,530	
Total fence per farm	Metres	2,530	

TABLE 59: PARTIALLY COMMERCIAL/COMMUNAL FARM FENCE MODEL

Farm type	Unit	Gift/own consumption	Other farmers	Rural Butcher	Trader/ middleman	Abattoir	Auction	Processor	Wholesaler	Total
Option 1: Fully Commercial	%	10	0	0	0	45	45	0	0	100
Option 2: Partially commercial/communal	%	10	20	0	20	40	10	0	0	100
Option 3: Fully Communal	%	10	25	20	10	15	20	0	0	100

TABLE 60: POINT OF SALE MODEL

Sale price	Unit	Option 1 Gift/own consumption	Sale to another farmer	Abattoir	Auction	Herd growth	Total	Option 2 Gift/own consumption	Sale to another farmer	Trader/ middleman	Abattoir	Auction	Herd growth	Total	Option 3 Gift/own consumption	Sale to another farmer	Trader/ middleman	Rural butcher	Abattoir	Auction	Herd growth	Total
Mature cows	Z$/Livestock unit	-	-	-	-	-	-	450	-	430	450	450	450	2,230	-	-	-	-	-	-	-	-
Bulls	Z$/Livestock unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heifers >2 years	Z$/Livestock unit	-	-	-	-	-	-	-	-	-	-	-	500	500	350	350	350	-	-	-	350	1,400
Heifers - yearlings	Z$/Livestock unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Steers >2 years	Z$/Livestock unit	495	-	495	495	-	1,485	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Steers - yearlings	Z$/Livestock unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weaned calf	Z$/Livestock unit	-	-	-	-	-	-	-	-	-	-	-	350	350	-	-	-	-	-	-	-	-
Unweaned calf	Z$/Livestock unit	-	-	-	-	495	495	-	-	-	-	-	-	-	-	-	-	-	-	-	300	300
Cow and calf	Z$/Livestock unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 61: VALUE OF SALES - POINT OF SALE PRICE

Grade composition	Unit	Option 1 Gift/own consumption	Sale to another farmer	Abattoir	Auction	Herd growth	Total	Option 2 Gift/own consumption	Sale to another farmer	Trader/ middleman	Abattoir	Auction	Herd growth	Total	Option 3 Gift/own consumption	Sale to another farmer	Trader/ middleman	Rural butcher	Abattoir	Auction	Herd growth	Total
Super	Livestock Unit	20	-	-	-	-	20	-	-	-	-	-	-	-	-	-	0.25	-	-	-	-	0
Choice	Livestock Unit	-	-	89	89	-	178	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Commercial	Livestock Unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Economy	Livestock Unit	-	-	-	-	-	-	2	-	1	2	1	-	6	-	-	-	-	-	-	-	-
Manufacturing	Livestock Unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
>2 yr Heifer	Livestock Unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.50	1
Weaned calf	Livestock Unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.25	0
Total	Livestock Unit	20	-	89	89	-	198	2	-	1	2	1	-	6	-	-	0.25	-	-	-	0.75	1.00

TABLE 62: VALUE OF SALES - POINT OF SALE GRADE

Value (offtake x grade mix x sale price)	Unit	Option 1: fully commercial Gift/own consumption	Sale to another farmer	Abattoir	Auction	Herd growth	Total	Option 2 Gift/own consumption	Sale to another farmer	Trader/ middleman	Abattoir	Auction	Herd growth	Total	Option 3 Gift/own consumption	Sale to another farmer	Trader/ middleman	Rural butcher	Abattoir	Auction	Herd growth	Total
Mature cows	Livestock unit	-	-	-	-	-	-	900	-	430	900	450	-	2,680	-	-	87.5	-	-	-	-	-
Bulls	Livestock unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heifers >2 years	Livestock unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	175	-
Heifers - yearlings	Livestock unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Steers >2 years	Livestock unit	9,789	-	44,049	44,049	-	97,886	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Steers - yearlings	Livestock unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Weaned calf	Livestock unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	75	-
Unweaned calf	Livestock unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cow and calf	Livestock unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Value	Livestock unit	9,789	-	44,049	44,049	-	97,886	900	-	430	900	450	-	1,780	-	-	88	-	-	-	250	338

TABLE 63: GROSS VALUE AT POINT OF SALE

Item	Unit	Option 1	Option 2	Option 3
Milking cows	% of cows	1	50	30
Milk Production	Litres/year	78,300	5,040	360
Milk consumption	Litres/year	78,300	2,520	270
Milk sales	Litres/year	-	2,520	90
Milk price	Z$/Litre	1	1	1
Total value of sales		-	2,520	90

TABLE 64: MILK VALUE MODEL

Item	Unit	Option 1	Option 2	Option 3
Own fields	Ha/year	-	2	4
Ploughing services sold	Ha/year	-	4	1
Total ploughed/year	Ha/year	-	6	5
Ploughing price	Z$/ha	-	65	50
Total value of sales		-	390	250

TABLE 65: DRAFT POWER VALUE MODEL

Item	Unit	Option 1	Option 2	Option 3
Manure produced	Mt/year	5,326	264	51
Manure used	Ha/year	5,060	251	2
Manure sold	Ha/year	266	13	4
Manure sale price	Z$/ha	5	5	5
Total value of sales		1,332	66	20

TABLE 66: MANURE VALUE MODEL

Inputs			Option 1: Fully commercial			Notes
	Unit	Z$/Unit	Units Used per animal/year	No. of animals	Total cost (Z$)	
Bought feed						
Maize and commercial beef concentrate	Mt	180.00	0.36	85	5,508.00	10kg per animal per day x 4 90 day cycles, transport not included
Winter supplement	Mt	33.35	-	-	2,001.00	60Mt per year. Transport Z$500/20mt truck = Z$8.35 per Mt
Forage/stover	Mt		-	-	200.00	Free. Assumes nominal on farm transport cost
Lick	Z$/Kg	0.56	0.10	549	30.72	Assumes 100g/animal x 25% of year
Vet chem #1: Dosing	Z$/head/year	1.50	1	653	979.50	
Vet chem #2: anti-biotics	Z$/head/year	0.55	1	653	359.15	
Dipping chem or dipping fee	Z$/head/year	2.00	12	653	15,672.00	
Veterinary/animal health advice	Visits/year	3.00	-	-	150.00	Z$50 per visit
Tractor fuel	Litres/year	1.27	0.08	653	63.50	500km/year
Water pumping	Litres/year	0.02	300	653	3,918.00	Pumping cost
Total					28,881.87	

TABLE 67: VALUE OF INPUTS - OPTION 1: FULLY COMMERCIAL

Inputs			Option 2: Patially commercial/communal			Notes
	Unit	Z$/Unit	Units Used per animal/year	No. of animals	Total cost (Z$)	
Bought feed	Z$/kg	-	0	13	-	None
Forage/stover	Z$/kg	-	0	13	-	Limited use of farm waste
Lick	Z$/herd/year	-	0	31.2	-	None
Vet chem #1: Dosing	Z$/herd/year	0.67	3	41	82.00	Dosing price higher because of small quantity - interviews
Vet chem #2: "3 in 1"	Z$/herd/year	0.5	4	41	82.00	
Dipping chem or dipping fee	Z$/herd/year	2	12	41	984.00	
Veterinary/animal health advice	Z$/herd/year	-	0	41	-	
Water	Z$/litre/year	-	0	41	-	
Total					1,148.00	

TABLE 68: VALUE OF INPUTS - OPTION 2: PARTIALLY COMMERCIAL/COMMUNAL

Inputs			Option 3: Fully communal			Notes
	Unit	Z$/Unit	Units Used per animal/year	No. of animals	Total cost (Z$)	
Bought feed	Z$/kg	0	0	0	0	
Forage/stover	Z$/kg	0	0	0	0	
Lick	Z$/herd/year	0	0	0	0	
Vet chem #1: Dosing	Z$/herd/year	0.83	3	7	17.5	
Vet chem #2: "3 in 1"	Z$/herd/year	2	1	7	14	
Dipping chem or dipping fee	Z$/herd/year	2	1	7	14	
Veterinary/animal health advice	Z$/herd/year	0	0	7	0	
Water	Z$/litre/year	0	0	7	0	
Total					45.5	

TABLE 69: VALUE OF INPUTS - OPTION 3: FULLY COMMERCIAL

Transport costs	Option 1: Commercial					Notes
	Unit	Z$/Unit	Units Used per animal/year	No. of animals	Total cost (Z$)	
Transport cost of purchased animals	Z$/year	50.00	1	10	500.00	Z$50 per trip per animal, assuming 10 purchased per year
Transport cost of sold animals	Z$/year	50.00	1	198	9,887.50	
Transport cost of sold manure	Lump sum	100.00	-	-	100.00	Lump sum - own farm transport
Transport cost of sold milk	Z$/liter	-	-	-	-	
Auction fees	Commission				1,468.29	3% on value of sales - assumes 50% auctioned
Marketing and promotion	Z$/trip/animal	-	-	-	-	None
Total cost of sales					11,955.79	

TABLE 70: COST OF SALES - OPTION 1: FULLY COMMERCIAL

Transport costs	Option 2: Partially commercial/communal					Notes
	Unit	Z$/Unit	Units Used per animal/year	No. of animals	Total cost (Z$)	
Transport cost of purchased animals	Z$/year	0	0	0	0	
Transport cost of sold animals	Z$/trip/animal	100	1	7.43	743	
Transport cost of sold manure	Z$/trip/animal	0	0	0	0	
Transport cost of sold milk	Z$/trip/litre	0	0	0	0	
Marketing and promotion	Z$/trip/animal	0	0	0	0	
Total cost of sales					743	

TABLE 71: COST OF SALES - OPTION 2: PARTIALLY COMMERCIAL/COMMUNAL

Transport costs	Option 3: communal					Notes
	Unit	Z$/Unit	Units Used per animal/year	No. of animals	Total cost (Z$)	
Transport cost of purchased animals	Z$/year	0	0	0	0	None purchased
Transport cost of sold animals	Z$/trip/animal	0	0	0	0	Buyer picks up
Transport cost of sold manure	Z$/trip/animal	0	0	0	0	None
Transport cost of sold milk		0	0	0	0	None
Marketing and promotion	Z$/trip/animal	0	0	0	0	None
Total cost of sales					0	

TABLE 72: COST OF SALES - OPTION 3: FULLY COMMUNAL

Land	Option 1: Commercial				Notes
	Unit	Z$/Unit	No. of units	Total cost (Z$)	
Rent	Z$/ha/year	7.50	1,120	8,400.00	Land paid in animals (to avoid tax). Eg. 21 weaners for 1,120 ha
Total				8,400.00	
Land	**Option 2: Commercial/communal**				**Notes**
	Unit	Z$/Unit	No. of units	Total cost (Z$)	
Rent	Z$/ha/year	-	40	-	No cost to farmer
Total				-	
Land	**Option 3: Communal**				**Notes**
	Unit	Z$/Unit	No. of units	Total cost (Z$)	
Rent	Z$/ha/year	-	5	-	Communal - though resale value near towns
Total				-	

TABLE 73: LAND COSTS

Capital costs	Option 1: Commercial					
	Unit	No. of Units	Cost per Unit	Life expectancy in years	Total	Notes
Cost of fencing	Z$/metre	1,259	0.70	20	43.88	4 strand
Cost of clamp/kraal	Z$	1	3,000.00	20	150.00	Movable handling unit
Cost of bore hole	Z$	3	4,600.00	20	690.00	One per 500ha
On farm transport	Piece	1	350.00	20	17.50	Scotch cart
Tractor	Piece	1	23,000.00	40	575.00	
Trailer	Piece	1	5,000.00	40	125.00	
Grass cutter and rake	Piece	1	5,000.00	40	125.00	
Total capital costs					1,726.38	

TABLE 74: ANNUALISED CAPITAL COSTS - OPTION 1: FULLY COMMERCIAL

Capital costs	Option 2: Patially commercial/communal					
	Unit	No. of Units	Cost per Unit	Life expectancy in years	Total	Notes
Cost of fencing	Z$/metre	2,530	0.70	20	88.20	4 strand
Cost of clamp/kraal	Z$	1	100.00	20	5.00	Home made
Cost of bore hole	Z$	0.05	4,600.00	20	11.50	Shared by 20 farmers
Productivity of bore hole	L/year					
On farm transport	Piece	1	350.00	20	17.50	
Tractor	Piece	-	-	-	-	
Other equipment (add)						
Total capital costs					122.20	

TABLE 75: ANNUALISED CAPITAL COSTS - OPTION 2: FULLY COMMERCIAL

Capital costs	Option 3: Fully communal					
	Unit	No. of Units	Cost per Unit	Life expectancy in years	Total	Notes
Cost of fencing	Z$/metre	0	0.50	20	0	
Cost of clamp/kraal	Z$	40	0.50	10	2	
Cost of bore hole	Z$	0	0	0	0	
Productivity of bore hole	L/year	0	0	0	0	
On farm transport	Piece	0	0	0	0	
Tractor	Piece	0	0	0	0	0
Other equipment (add)						
Total capital costs					2	

TABLE 76: ANNUALISED CAPITAL COSTS - OPTION 3: FULLY COMMUNAL

Labour	Option 1: Fully commercial				
	Unit	No. of units	Cost per unit (Z$)	Total	Notes
Farm workers	Person days/year	9	150.00	16,200.00	Z$100/month + 10kg maize + accommodation
Farm Manager	Person days/year	1	300.00	3,600.00	Z$250/month + 10kg maize
Total Labour costs		10		19,800.00	
Labour	Option 2: Partially commercial/communal				
	Unit	No. of units	Cost per unit (Z$)	Total	Notes
Farm workers	Person days/year	-	-	-	Family labour
Farm Manager	Person days/year	-	-	-	Family labour
Total Labour costs				-	
Labour	Option 3: Fully communal				
	Unit	No. of units	Cost per unit (Z$)	Total	Notes
Farm workers	Person days/year	-	-	-	Family labour
Farm Manager	Person days/year	-	-	-	Family labour
Total Labour costs				-	

TABLE 77: LABOUR COSTS

Fees and other expenses	Option 1: Fully commercial				
	Unit	No. of units	Cost per unit (Z$)	Total	Notes
Land tax	Z$/ha/year	440	5.00	2,200.00	Not on leased land to assume one third owned
VAT					15% of auction commission
Farmers union dues	Z$/year	1	20.00	20.00	
Carcas permit	Z$/year	3			Own consumption only
Vet permits	Person days/year	198	20.00	3,955.00	Flat fee per animal sold
Total fees and taxes				6,175.00	

TABLE 78: FEES AND OTHER EXPENSES - OPTION 1: FULLY COMMERCIAL

Fees and other expenses	Option 2: Partially commercial/communal				
	Unit	No. of units	Cost per unit (Z$)	Total	Notes
Hut tax	Z$/year	1	15.00	15.00	
Farmers union dues	Z$/year	1	2.00	2.00	
Carcas permit	Z$/year	2	20.00	40.00	Own consumption only
Vet permits	Per animal sold	7	10.00	74.00	Flat fee per animal sold
Total fees and taxes				131.00	

TABLE 79: FEES AND OTHER EXPENSES - OPTION 2: PARTIALLY COMMERCIAL/COMMUNAL

Fees and other expenses	Option 3: Fully communal				
	Unit	No. of units	Cost per unit (Z$)	Total	Notes
Hut tax	Z$/year	1	15.00	15.00	Not on leased land to assume one third owned
Farmers union dues	Z$/year	1	2.00	2.00	
Carcas permit	Z$/year	-	20.00	-	Own consumption only
Vet permits	Per animal sold	-	10.00	-	Paid by buyer
Total fees and taxes				17.00	

TABLE 80: FEES AND OTHER EXPENSES - OPTION 3 FULLY COMMUNAL

Labour taxes and fees	Option 1: Fully commercial				
	Unit	No. of units	Cost/unit	Total	
Income tax	Z$/month	10	-	-	Below tax threshold
NSSA	Z$/month	10	49.50		
NEC contribution	Z$/month	10	10.00		
Union fees	Z$/month	10	49.50		
Total labour tax and deductions			109.00		

TABLE 81: LABOUR TAXES AND FEES - OPTION 1: FULLY COMMERCIAL

		Option 1 Fully commercial	Option 2 Partially commercial/ communal	Option 3 Fully communal	Notes
Value of production					
	Value of growth in herd	-	-	250.00	
	Value of sales	88,097.63	1,780.00	87.50	
	Value of consumption	9,788.63	900.00	-	
	Value of manure	1,331.57	66.07	20.00	
	Value of draught power	-	390.00	250.00	
	Value of milk	-	2,520.00	90.00	
Total value of production		99,217.82	5,656.07	697.50	
Intermediate goods and services					
	Inputs	28,881.87	1,148.00	45.50	
	Transport	11,955.79	743.00	-	
Total intermediate goods and services		40,837.66	1,891.00	45.50	
Value addition					
	Land	8,400.00	-	-	
	Labour	19,800.00	-	-	
	Financial charges	-	-	-	
	Fees & taxes	6,175.00	131.00	17.00	
	Subsidies	-	-	-	
Total value addition		34,375.00	131.00	17.00	
Gross profit		24,005.16	3,634.07	635.00	
	Capital costs	1,726.38	122.20	2.00	
Net profit		22,278.78	3,511.87	633.00	

TABLE 82: SUMMARY FARM MODELS - OPTIONS 1 - 3

Annex 5: Intermediate actor models used in the AFA analysis

Business parameters			Unit	Value	Notes
	Throughput	Total turnover per month	$		
		Percentage of throughput = beef products	%	20	Also selling fish, lamb and chicken
	Operating days per month		Day	22	

TABLE 83: AGRODEALER - BUSINESS PARAMETER ASSUMPTIONS

		Item		Unit	No. of units	Average cost/unit	Total cost /month	Life	Notes
Inputs	Variable	Purchase of agrochems							
		Sub total cost of purchases					5,000.00		Guess
		Manager/cashier	Monthly costs (net)	Z$/month	1	300.00	300.00		
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	9.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	9.00			
		Sales person	Monthly costs (net)	Z$/month	2	250.00	500.00		
			Income tax	Z$/month	2	-			
			NSSA	Z$/month	2	7.50			
			NEC contribution	Z$/month	2	1.00			
			Union fees	Z$/month	2	7.50			
		Guard services		Z$/month	1	450.00	450.00		Contract
		Compliance	Trading license	Unit	1	250.00	20.83		
		Energy	Electricity	Days	22	5.00	110.00		Prepaid card
		Packaging	Bags	Lump sum	1	20.00	20.00		
		Land and building rental		Z$/month	1	300.00	300.00		Guess
		Card reader for epayment		Lump sum	1	40.00	40.00		Merchant charges
		Mobile phone credit		Lump sum	1	15.00	15.00		For card reader
		Sub total variable costs					1,455.83		
		Sub total variable costs by beef product throughput					291.17		Variable costs x % beef throughput
Total deduction - labour tax						51.00			
	Capital equipment	Shop fittings	Table	Unit	3	100.00	15.00	20	
			Shelving	Unit	3	100.00	15.00	20	
		Equipment (office)	Computer	Unit	1	300.00	1.25	20	
			Table/desk	Set	1	100.00	0.83	10	
			Mobile phone	Unit	1	20.00	0.33	5	
		Marketing and promotion		Lump sum	1	20.00	20.00		
		Taxes							None identified
		Insurance							None
		Finance costs							None
		Sub total capital costs					52.42		
		Sub total variable costs by beef product throughput					10.48		Capital costs x % beef throughput
TOTAL COSTS							5,301.65		
Income	Sales	De-wormer		Z$			-		
		3 in 1		Z$			-		
		Feed		Z$			-		
		Anti-biotics		Z$			-		
		Fencing wire		Z$			-		
		Poles		Z$			-		
		Ploughs		Z$			-		
		Shear		Z$			-		
		Plough wheel		Z$			-		
		Yoke		Z$			-		
		Harness		Z$			-		
		Chain		Z$			-		
TOTAL INCOME							7,000.00		
TOTAL PROFIT (after tax)							1,698.35		

TABLE 84: AGRODEALER - BUSINESS MODEL

Business parameters			Unit	Value	Notes
	Throughput	Total turnover per month	Mt	3,000	
		Cattle feed throughput	%	10	Assumes 30% ruminants and 40% of that beef cattle
	Operating days per month		Day	30	
	Vehicles	7mt panel truck	Unit	75,000	
		Pick-up	Unit	20,000	
	Input volume	Manufacturing	Mt/month	300	
				%	Source = Cattle maintenance ration
	Input price	Maize	Z$/Mt	290.00	5.6 Local
		Maize bran	Z$/Mt	130.00	36.0 Imported
		Cotton seed hulls	Z$/Mt	140.00	18.0 Local
		Molases	Z$/Mt	140.00	15.0 Local
		Cotton seed cake	Z$/Mt	310.00	10.0 Local
		Whole cotton seed	Z$/Mt	310.00	10.0 Local
		Lime flour	Z$/Mt	110.00	2.5 Local
		Urea	Z$/Mt	850.00	2.0 Imported
		Salt	Z$/Mt	2,000.00	0.7 Imported
		Minerals & vitamins	Z$/Mt	2,000.00	0.2 Imported
		Total	Z$/Mt		100.0
	Percentage of feed imported				38.9
	Sale price	Cattle ration	Z$/Mt	300.00	Factory gate
	Labour numbers	Office staff	FTE	4	
		Shop floor staff	FTE	25	
	Milage	7mt panel truck	Km/month	3,000	Assumes 100km/day
		Pick-up	Km/month	3,600	Assumes 120km/day
	Km/litre of diesel used	7mt panel truck	L/Km	15	
		Pick-up	L/Km	25	
	Engine oil price		Litres	5.00	
	Diesel price		Litres	1.27	
	Packaging costs	Bags	Piece	0.50	50kg woven polyethelyne locally made
	Electricity use	Proportion of turnover	%	0.7	
	Water use	Proportion of turnover	%	0.7	
	Maintenance and cleaning	Proportion of turnover	%	0.7	
	Land rental price	Cost per month	Lump sum	2,000.00	0.5ha
	Cost of finance		%	12	
	Factory losses	Shrinkage	%	2	Dust etc

TABLE 85: FEED MANUFACTURER - BUSINESS PARAMETER ASSUMPTIONS

		Item		Unit	No. of units	Average cost/unit	Total cost /month	Life	Notes
Inputs	Variable	Inputs							
		Maize		Mt	16.80	290.00	4,872.00		
		Maize bran		Mt	108.00	130.00	14,040.00		
		Cotton seed hulls		Mt	54.00	140.00	7,560.00		
		Molases		Mt	45.00	140.00	6,300.00		
		Cotton seed cake		Mt	30.00	310.00	9,300.00		
		Whole cotton seed		Mt	30.00	310.00	9,300.00		
		Lime flour		Mt	7.50	110.00	825.00		
		Urea		Mt	6.00	850.00	5,100.00		
		Salt		Mt	2.10	2,000.00	4,200.00		Use 72kg/day
		Minerals & vitamins		Mt	0.60	2,000.00	1,200.00		Use 120kg/day
		Sub total cost of purchases per month			300.00		62,697.00		Cattle feed only
	Labour	Chief Executive	Monthly salary (net)	Z$/month	1	6,000.00	6,000.00		Full time employee
			Income tax	Z$/month	1	1,565.00			
			NSSA	Z$/month	1	180.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	180.00			
		Secretary/accountant	Monthly costs (net)	Z$/month	1	2,000.00	2,000.00		
			Income tax	Z$/month	1	365.00			
			NSSA	Z$/month	1	60.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	60.00			
		Sales manager	Monthly costs (net)	Z$/month	1	1,500.00	1,500.00		
			Income tax	Z$/month	1	240.00			
			NSSA	Z$/month	1	45.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	45.00			
		Sales staff	Monthly costs (net)	Z$/month	2	700.00	1,400.00		
			Income tax	Z$/month	2	80.00			
			NSSA	Z$/month	2	21.00			
			NEC contribution	Z$/month	2	1.00			
			Union fees	Z$/month	2	21.00			
		Plant supervisor	Monthly costs (net)	Z$/month	1	700.00	700.00		
			Income tax	Z$/month	1	80.00			
			NSSA	Z$/month	1	21.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	21.00			
		Deputy supervisor	Monthly costs (net)	Z$/month	1	450.00	450.00		
			Income tax	Z$/month	1	30.00			
			NSSA	Z$/month	1	13.50			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	13.50			
		General hands	Monthly costs (net)	Z$/month	23	250.00	5,750.00		
			Income tax	Z$/month	23	-			
			NSSA	Z$/month	23	7.50			
			NEC contribution	Z$/month	23	1.00			
			Union fees	Z$/month	23	7.50			
		Driver - truck	Monthly costs (net)	Z$/month	1	320.00	320.00		
			Income tax	Z$/month	1	4.00			
			NSSA	Z$/month	1	9.60			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	9.60			
		Driver - pick-up	Monthly costs (net)	Z$/month	2	300.00	600.00		
			Income tax	Z$/month	2	-			
			NSSA	Z$/month	2	9.00			
			NEC contribution	Z$/month	2	1.00			
			Union fees	Z$/month	2	9.00			
		Guard services	On site	Z$/month	3	450.00	1,350.00		
			Rapid response	Z$/month	1	69.00	69.00		
		Feed consultant		Z$/month	1	500.00	500.00		
		Compliance	Factory License	Unit	1	58.33	58.33		Z$700/year
			Business License						
			Agric Marketing Authority	Unit	1	83.33	83.33		Z$1,000/year
			NSS Inspection	Unit	1	10.00	10.00		Z$120/year
			EMA	Unit	1	100.00	8.33		
			Min of Ag Permit	Unit	1	70.00	5.83		
			DVLS	Unit	1	20.00	1.67		Z$20/year
			Stockfeed registrar	Unit	1	30.00	2.50		Z$30/year
			DVSL GMO free certificate	Unit	1	60.00	5.00		Z$60/year >2,000mt
			Membership of Association	Unit	1	60.00	60.00		Stockfeed Manufacturers
			Medical checkup	Unit	25	50.00	1,250.00		Z$50/worker per year
		Energy	Electricity	Lump sum	1	438.88	438.88		
			Fuel for vehicle	Litres	488	1.27	619.76		
			Lubricants for vehicle	Litres	3	5.00	15.00		
		Water	Production	Lump sum	1	4,388.79	4,388.79		
		Maintenance & repairs		Lump sum	1	4,388.79	4,388.79		
		Feed formulation software fees		Annual	1	1,000.00	83.33		
		Waste	Shrinkage	%	2	12,539.40	75,236.40		
		Packaging	Bags	Bags	6,000.00	0.50	3,000.00		
		Land and building rental		Z$/m2	1,000	2.50	2,500.00		
		Mobile phone credit		Lump sum	1	100.00	100.00		
		Laboratory costs	Near Infra Red testing	Per sample	900	25.00	22,500.00		
		Sub total variable costs					112,894.95		
		Sub total variable costs by beef ration throughput					11,289.50		Variable costs x % beef throughput
	Total deduction - labour tax								
	Capital equipment	Feed mill		Unit	1	1,000,000.00	8,333.33	10	Including buildings
		Vehicles	7mt panel truck	Unit	1	75,000.00	6,250.00	5	Imported
			Pick-up	Unit	2	20,000.00	3,333.33	5	Imported
		Clothing	Clothing set	Set	75	15.00	93.75	n/a	3 x a year
		Equipment (office)	Set	Unit	4	2,000.00	666.67	10	
		Feed formulation software		Unit	1	4,000.00	333.33		
		Marketing and promotion		Lump sum	1	22,570.92	1,880.91		3% of turnover
		Taxes	Council rates	Lump sum	1	1,880.91	156.74		None identified
			Corporation tax	%	25	25,000.00	25,000.00		
		Insurance		Lump sum	1	1,253.94	104.50		2% of turnover
		Finance costs	Stockholding	Lump sum	1	27,085.10	2,257.09		9 days of input stocks
		Sub total capital costs					48,409.66		
		Sub total variable costs by beef ration throughput					4,840.97		Capital costs x % beef throughput
TOTAL COSTS							82,160.79		
Income	Sales	Cattle ration sales		Mt	300	300.00	90,000.00		Wholesale
TOTAL INCOME							90,000.00		
TOTAL PROFIT (after tax)							7,839.21		

TABLE 86: FEED MANUFACTURER - BUSINESS MODEL

Business parameters			Unit	Value	Notes
	Return journeys from farm to auction/abattoir	Capacity	Km/month	2,000	Based on 1 x 3.5mt truck working 5 days a week. Charge per Km (not head). Assumes 2.5 trips per week @200km round trip
		Actual throughput	Km/month	3,200	Assumes 3-4 operating days a week = 2 round trips
	No. of trucks	3.5Mt	Unit	1	
	No. of animals per load		Head	9	
	Truck cost		Unit	12,000	
	No. of round trips		Trips/month	8	
	Corporate tax rate		%	25	
	Assumed net profit for tax		% of net profit	25	Profit for tax purposes
	Km/litre of diesel used		Km	7	
	Engine oil price		Litres	5	
	Diesel price		Litres	1.27	
	Charge for services		Km	1	Flat rate

TABLE 87: TRANSPORTER <10 HEAD/TRIP - BUSINESS PARAMETER ASSUMPTIONS

		Item		Unit	No. of units	Average cost/unit	Total cost	Replacement/life expectancy	Notes
Inputs	Variable	Part time staff - driver	Monthly salary (net)	Sum all FTEs	3,000	0.10	300.00		Paid by distance travelled (10c/km). Assumes average of 3,000km/month
			Income tax	Sum all FTEs	-	-	-		
			Other taxes	Sum all FTEs	-	-	-		
		Part time staff - office			0.25	400.00	100.00		Assumes shared with other business
		Guard services	Monthly	Z$/month	0.25	550.00	137.50		Assumes shared with other business
		Staff development	n/a		-	-	-		
		Compliance	Vehicle license fee	Annual fee	3	105.00	315.00		$105 every 4 months
		Tolls and fees	Tolls	Toll gate	-	-	-		Paid by client
			Other payments	Trip	8	50.00	400.00		Informal payments - estimate per round trip
		Energy	Fuel (diesel)	Litres	457.14	1.27	580.57		
			Fuel (lubricants)	Litres	0.37	5.00	1.83		8 litres per oil change. Service every 10000km
		Maintenance and warrantees	Regular service	Piece	0.20	300.00	60.00		
			Engine rebuild	Unit	1	27.78	27.78		Every 36 months
			Tyres	Set of 6	0.04	1,500.00	62.50	Every 2 years	
		Land and building rental	Monthly	Z$/month	0.25	750.00	187.50		Shares with other businesses
		Mobile phone charges	Monthly	Z$/month	1	50.00	50.00		Run from a mobile phone
	Sub total variable						2,172.68		
	Capital equipment	Equipment (office)	Mobile phone	Piece	1	16.67	16.67	Every 5 years	Assumes office set of Z$1,000
		Equipment (vehicles)	3.5mt truck	Piece	1	50.00	50.00	20 years	Estimated landed cost of second hand 7Mt truck in Harare / 240 months life
		Marketing and promotion			-	-	-		None
		Taxes		Percent	%	25		60.00	
		Insurance		Lump sum		1	50.00	50.00	
		Finance costs		Lump sum	%	-		-	Self financed
		Losses		Fatalities	Head	-	-	-	Losses born by buyer
	Sub total capital						176.67		
TOTAL COSTS							2,349.34		
Income	Sales	Transport services		Km	3,200.00	1.00	3,200.00		
TOTAL INCOME							3,200.00		
TOTAL PROFIT (after tax)							850.66		

TABLE 88: TRANSPORTER <10 HEAD/TRIP - BUSINESS MODEL

Business parameters			Unit	Value	Notes
	Return journeys from farm to auction/abattoir	Capacity	Km/month	10,000	Based on 5 trucks x 20 round trips x 100km per trip
		Actual throughput	Km/month	8,000	Assumes 4 trucks x 15 round trips x 100km per trip
	No of trucks	7mt truck + 5mt trailer	Unit	5	One currently unservisable
	No. of animals per load		Head	24	
	Truck cost		Unit	100,000	Replacement cost
	No. of round trips		Trips/month	15	
	Corporate tax rate		%	25	
	Assumed net profit for tax		% of net profit	25	Profit for tax purposes
	Km/litre of diesel used		Km	2.8	
	Engine oil price		Litres	5	
	Diesel price		Litres	1.27	
	Charge for services		Km	3.30	Flat rate

TABLE 89: TRANSPORTER >10 HEAD/TRIP - BUSEINSS PARAMETER ASSUMPTIONS

		Item		Unit	No. of units	Average cost/unit	Total cost	Replacement/life expectancy	Notes
Inputs	Variable	Part time staff - driver	Monthly salary (net)	Z$/month	5	400.00	2,000.00		Salary of $400/month
			Income tax	Z$/month	-	-	-		
			Other taxes	Z$/month	-	-	-		
		Part time staff - office	Monthly salary (net)	Z$/month	1	500.00	500.00		
			Income tax	Z$/month	-	-	-		
			Other	Z$/month	-	-	-		
		Guard services	Monthly	Z$/month	1	550.00	550.00		Security service
		Staff development	n/a		-	-	-		
		Compliance	Vehicle license fee	Annual fee	5.00	320.00	1,600.00		$105 every 4 months
		Tolls and fees	Tolls	Toll gate	-	-	-		Paid by client
			Police fines	Lump sum	1.00	200.00	200.00		Informal payments - estimate
		Energy	Fuel (diesel)	Litres	2,857.14	1.27	3,628.57		
			Fuel (lubricants)	Litres	2.29	5.00	11.43		8 litres per oil change. Service every 10000km
		Maintenance and warrantees	Regular service	Piece	1.00	300.00	300.00		
			Engine rebuild	Unit	1	55.56	55.56		Every 36 months
			Tyres	Set of 12	0.04	7,200.00	300.00	Every 2 years	
		Land and building rental	Monthly	Z$/month	1	1,000.00	1,000.00		None
		Mobile phone charges	Monthly	Z$/month	1	150.00	150.00		Run from a mobile phone
	Sub total variable						10,295.56		
	Capital equipment	Equipment (office)	Lump sum	Piece	1	33.33	33.33	Every 5 years	Assumes office set of Z$2,000
		Equipment (vehicles)	7Mt truck and trailer	Piece	5	416.67	2,083.33	20 years	Estimated landed cost of second hand 7Mt truck in Harare / 240 months life
		Marketing and promotion			-	-	-		None
		Taxes		Percent	%	25		1,702.47	Assume of net income
		Insurance		Lump sum		1	5,000.00	5,000.00	
		Finance costs		Lump sum	%	12		1,235.47	Self financed
		Losses		Fatalities	Head	-	-	-	Losses born by buyer
	Sub total capital						10,054.60		
TOTAL COSTS							20,350.16		
Income	Sales	Transport services		Km	8,000.00	3.30	26,400.00		
TOTAL INCOME							26,400.00		
TOTAL PROFIT (after tax)							6,049.84		

TABLE 90: TRANSPORTER >10 HEAD/TRIP - BUSINESS MODEL

Business parameters			Unit	Value	Notes
	Throughput	Total turnover per month	Head	750	Total sales of cattle
	Cattle sales per month		Head	750	
	Proportion of auction business catte sales		%	50	
	Average hammer price		Head	500	
	Operating days per month		Day	4	
		Pick-up	Unit	20,000	
	Auction charges	% of sales value	%	6	Charged to buyer
	Labour numbers	Office staff	FTE	6	
		Field workers	FTE	6	
	Milage	Pick-up	Km/month	3,300	Assumes 150km/day
	Km/litre of diesel used	Pick-up	L/Km	25	
	Engine oil price		Litres	5.00	
	Diesel price		Litres	1.27	
	Electricity use	Proportion of turnover	%	0.7	
	Water use	Proportion of turnover	%	0.7	
	Maintenance and cleaning			0.7	
	Office rental	Cost per month	Lump sum	3,000.00	Three branches plus head office
	Cost of finance		%	12	

TABLE 91: AUCTION - BUSINESS PARAMETER ASSUMPTIONS

		Item		Unit	No. of units	Average cost/unit	Total cost /month	Life	Notes
Inputs	Variable								
		Cost of inputs			-		-		
	Labour	Chief Executive	Monthly salary (net)	Z$/month	1	6,000.00	6,000.00		Full time employee
			Income tax	Z$/month	1	1,565.00			
			NSSA	Z$/month	1	180.00			
			NEC contributin	Z$/month	1	1.00			
			Union fees	Z$/month	1	-			
		Secretary/accountant	Monthly costs (net)	Z$/month	1	2,000.00	2,000.00		
			Income tax	Z$/month	1	365.00			
			NSSA	Z$/month	1	60.00			
			NEC contributin	Z$/month	1	1.00			
			Union fees	Z$/month	1	60.00			
		Sales manager	Monthly costs (net)	Z$/month	1	1,500.00	1,500.00		
			Income tax	Z$/month	1	240.00			
			NSSA	Z$/month	1	45.00			
			NEC contributin	Z$/month	1	1.00			
			Union fees	Z$/month	1	45.00			
		Office staff	Monthly costs (net)	Z$/month	3	1,200.00	3,600.00		2 x Brance + 2 x HQ
			Income tax	Z$/month	3	180.00			
			NSSA	Z$/month	3	36.00			
			NEC contributin	Z$/month	3	1.00			
			Union fees	Z$/month	3	36.00			
		Total management and office			6				
		Total deductions - office				3,322.00			
		Supervisor	Monthly costs (net)	Z$/month	1	350.00	350.00		
			Income tax	Z$/month	1	10.00			
			NSSA	Z$/month	1	10.50			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	10.50			
		General hands	Monthly costs (net)	Z$/month	4	250.00	1,000.00		
			Income tax	Z$/month	4	-			
			NSSA	Z$/month	4	7.50			
			NEC contribution	Z$/month	4	1.00			
			Union fees	Z$/month	4	7.50			
		Driver - pick-up	Monthly costs (net)	Z$/month	1	400.00	400.00		
			Income tax	Z$/month	1	20.00			
			NSSA	Z$/month	1	12.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	12.00			
		Total Field			6				
		Total deductions - field				141.00			
		Guard services	On site	Z$/month	2	450.00	900.00		
			Rapid response	Z$/month	1	69.00	69.00		
		Compliance	Factory License	Unit	1	58.33	58.33		Z$700/year
			Business License						
			Agric Marketing Authority	Unit	1	83.33	83.33		Z$1,000/year
			NSS Inspection	Unit	1	10.00	10.00		Z$120/year
			EMA	Unit					Unknown
			DVSL GMO free certificate						
			Membership of Association	Unit	1	60.00	60.00		Stockfeed Manufacturers
			Medical checkup	Unit	6	50.00	300.00		Z$50/worker per year
		Energy	Electricity	Lump sum	1	-	-		
			Fuel for vehicle	Litres	132	1.27	167.64		
			Lubricants for vehicle	Litres	1	5.00	5.00		
		Water	Maintenance at auction	Lump sum	1	-	-		Paid by seller
		Maintenance & repairs		Lump sum	1	-	-		
		Land and building rental	Office	Lump sum	3	600.00	1,800.00		
		Mobile phone credit		Lump sum	1	100.00	100.00		
		Sub total variable costs					18,403.31		
		Sub total variable costs by beef cattle throughput					9,201.65		Variable costs x % beef throughput
	Capital equipment	Vehicles	Pick-up	Unit	2	20,000.00	666.67	5	Imported
		Clothing	Clothing set	Set	18	15.00	22.50	n/a	3 x a year
		Equipment (office)	Set	Unit	6	1,500.00	750.00	10	
		Card reader							
		Marketing and promotion		Lump sum	1	2,000.00	166.67		
		Taxes	Corporation tax	%	25	12,500.00	1,041.67		
		Insurance		Lump sum	1	1,000.00	83.33		
		Finance costs		Lump sum	1	-	-		
		Sub total capital costs					2,730.83		
		Sub total variable costs by beef cattle throughput					1,365.42		Capital costs x % beef throughput
TOTAL COSTS							11,233.74		
Income	Sales	Auction fees		%	750	6	22,500.00		
TOTAL INCOME							22,500.00		
TOTAL PROFIT (after tax)							11,266.26		

TABLE 92: AUCTION - BUSINESS MODEL

Business parameters			Unit	Value	Notes
	Throughput	Purchases per month	Head	108	Jun to Dec 200, Jan to Feb 50
		Sales per month	Head	108	Total = 1,300
	Operating days per month		Day	22	
	Cost of transport hire	7mt truck	Z$/Head	30	>15 heads picked up free by abattoir. Est 50% own transport. =650 head / 10 head per load =
	Buying price	Animal at farm	Z$/Head	250	
	Weight on arrival at abattoir		Kg/Head	320	
	CDM		%	45	
	CDM		Kg/Head	144	
	Selling price	Animal at abattoir/auction	Kg		sold on CDM; manf@2.30 (5%), econ+comm @$3.10 (80%) and super @ $4.60 (15%)
	Selling price		Kg/Head	350.00	
	Vehicle costs	7mt truck	Z$		Assume rental only (see above)
		Pick-up	Z$		
	Milage	7mt truck	Km/month		
		Pick-up	Km/month		
	Km/litre of diesel used	7mt truck	L/month		
		Pick-up	L/month		
	Engine oil price		Litres	5	
	Diesel price		Litres	1.27	
	Mortality	Transit losses	%	<1%	Death during transport

TABLE 93: MIDDLEMAN - BUSINESS PARAMETER ASSUMPTIONS

		Item		Unit	No. of units	Average cost/unit	Total cost /month	Life	Notes
Inputs	Variable	Purchase of animals	Weighted average	Head	108	250.00	27,083.33		
		Sub total cost of purchases					27,083.33		
		Manager	Monthly salary (net)	Z$/month	1	1,000.00	1,000.00		Full time employee
			Income tax	Z$/month	1	140.00			
			NSSA	Z$/month	1	30.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	30.00			
		Buyer	Monthly costs (net)	Z$/month	1	250.00	250.00		
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	7.50			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	7.50			
		Hand	Monthly costs (net)	Z$/month	1	250.00	250.00		
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	7.50			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	7.50			
		Compliance							
		Police clearance		Unit	4.33	10.00	43.33		Z$10/25 head
		Veterinary permits		Unit	4.33	10.00	43.33		$10 per 25 beasts + $2 per beast transport
		Transport for vet permits		Unit	108	2.00	217		
		Premium on cash		Lump sum	108	35.00	3,780.00		Pays 20% premium on cash and farmers paid half cash and other half emoney
		Mobile phone credit		Lump sum	1	50.00	50.00		
		Sub total variable costs					5,633.33		
	Total labour tax					233.00			
	Capital equipment	Equipment (office)	Office equipment set	Unit		600.00	-	20	
			Mobile phone	Unit		20.00	-	5	
		Marketing and promotion		Lump sum		100.00	100.00		
		Taxes							None identified
		Insurance							None
		Sub total capital costs					100.00		
TOTAL COSTS							32,816.67		
Income	Sales	Animals	Average	Z$/Head	108	350.00	37,916.67		
TOTAL INCOME							37,916.67		
TOTAL PROFIT (after tax)							5,100.00		

TABLE 94: MIDDLEMAN - BUSINESS MODEL

Business parameters			Unit	Value	Notes			
	Throughput	Head per day	Head	50				
	Operating days per month		Day	30				
	Throughput per month		Head	1,500				
	No. of 8 hour shifts		Shifts/day	1				
	Vehicles		Unit					
	Collection	7mt truck	Unit	75,000	Assume 1			
		3.5mt truck	Unit	12,000	Assume 2			
	Distribution	5mt refrigerated truck	Unit	45,000	Assume 1			
		2mt refrigerated truck	Unit	32,000	Assume 2			
	Input price	Average buying price	Z$/Head	350.00				
	Proportion of throughput collected from farms		%	50.00				
	Average animal weight on arrival		Kg	320.00	Live weight - data from MC Meat - Communal cattle			
	Outputs ratios	Meat - carcass	%	45.00				
		Trimmings	%	3.00				
		Fat	%	3.00				
		5th Quarter	%	27.00	Including head and feed etc			0.2125
		Hides	%	6.00				
		Blood	%	16.00				
		Total	%	100.00				
	Output volume per head	Meat - carcass	Kg	144.00				
		Trimmings	Kg	9.60				
		Fat	Kg	9.60				
		5th Quarter	Kg	86.40				
		Hides	Kg	19.20				
		Blood	Kg	51.20	From Jayakilathan et al 2012			
	Ex factory prices	Trimmings	Z$/kg	0.80				
		Fat	Z$/kg	1.00				
		5th Quarter	Z$/kg	1.00	Estimate			
		Hides	Z$/kg	0.80				
	Grade ratios	Super	%	28.00	National figures			
		Choice	%	3.00				
		Commercial	%	26.00				
		Economy	%	37.00				
		Manufacturing	%	6.00				
		Total		100.00	Typical volume/month	%		
	Sales prices	Super	Z$/kg	4.50	364		7	
		Choice	Z$/kg	3.90	84		2	
		Commercial	Z$/kg	3.80	1441		29	
		Economy	Z$/kg	3.50	2951		59	
		Manufacturing	Z$/kg	2.20	202		4	
		Weighted average sale price		3.61				
	No. of saleble hides		Piece	1350.00	Assume 90% of animals slaughtered			
	Green weight to live weight		%	6.00	Deducted by reducing Terry et all (1990) by 25%			
	Green weight	Flayed weight per hide	Kg					
	Wet salted weight		Kg		After salting but still wet - 70%			
	Average Cold Dressed Weight		%	45.00				
	Hide ex factory price		Z$/hide	0.80				
	Manure volume		Mt/month	20.00	Estimate			
	Manure value		Z$/Mt	10.00				
	Stomach content volume		Mt/month	20.00	Estimate			
	Stomach content value		Z$/Mt	10.00				
	Milage	7mt truck	Km/month	9,000	Assumes 300km/day			
		3.5mt truck	Km/month	9,000	Assumes 200km/day			
		5mt refrigerated truck	Km/month	9,000	Assumes 200km/day			
		2mt refrigerated truck	Km/month	9,000	Assumes 200km/day			
	Km/litre of diesel used	7mt truck	L/Km	4				
		3.5mt truck	L/Km	7				
		5mt refrigerated truck	L/Km	15				
		2mt refrigerated truck	L/Km	10				
	Engine oil price		Litres	5.00				
	Diesel price		Litres	1.27				
	Electiricity price		KwH	0.12				
	Water		Z$/Litre	0.05				
	Water use	Production/day	Litres	1,200				
		Cleaning/day	Litres	1,400				
	Salt use per hide		Kg	10	Estimate			
	Salt price		Z$/kg	0.10				
	Land rental price		Z$/m2	2.00				
	Cost of finance		%	12				
	Losses	Animals condemed per month						
	Waste	Shrinkage	%	1	Moisture loss			

TABLE 95: ABATTOIR - BUSINESS PARAMETER ASSUMPTIONS

		Item		Unit	No. of units	Average cost/unit	Total cost /month	Life	Notes
Inputs	Variable	Purchase of animals		Head	1,500	350.00	525,000.00		
		Sub total cost of purchases					525,000.00		
	Labour - office	Director	Monthly salary (net)	Z$/month	1	5,000.00	5,000.00		Full time employee
			Income tax	Z$/month	1	1,215.00			Assume 5,000+ rate
			NSSA	Z$/month	1	150.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	150.00			3%
		Secretary	Monthly costs (net)	Z$/month	1	700.00	700.00		
			Income tax	Z$/month	1	80.00			
			NSSA	Z$/month	1	21.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	21.00			
		Marketing	Monthly costs (net)	Z$/month	2	500.00	1,000.00		
			Income tax	Z$/month	2	40.00			
			NSSA	Z$/month	2	15.00			
			NEC contribution	Z$/month	2	1.00			
			Union fees	Z$/month	2	15.00			
		Accountant	Monthly costs (net)	Z$/month	1	700.00	700.00		
			Income tax	Z$/month	1	80.00			
			NSSA	Z$/month	1	21.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	21.00			
		Total office			5		7,400.00		
		Total deductions - office					1,904.00		
		Plant manager	Monthly costs (net)	Z$/month	1	1,200.00	1,200.00		
			Income tax	Z$/month	1	180.00			
			NSSA	Z$/month	1	36.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	36.00			
		Quality control	Monthly costs (net)	Z$/month	1	1,000.00	1,000.00		
			Income tax	Z$/month	1	140.00			
			NSSA	Z$/month	1	30.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	30.00			
		Foreman	Monthly costs (net)	Z$/month	1	700.00	700.00		
			Income tax	Z$/month	1	80.00			
			NSSA	Z$/month	1	21.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	21.00			
		Workers	Monthly costs (net)	Z$/month	20	300.00	6,000.00		
			Income tax	Z$/month	20	-			
			NSSA	Z$/month	20	9.00			
			NEC contribution	Z$/month	20	1.00			
			Union fees	Z$/month	20	9.00			
		Total factory			23	3,200.00	8,900.00		
		Total deductions - Plant					957.00		
		Driver	Monthly costs (net)	Z$/month	3	320.00	960.00		
			Income tax	Z$/month	3	4.00			
			NSSA	Z$/month	3	9.60			
			NEC contribution	Z$/month	3	1.00			
			Union fees	Z$/month	3	6.40			
		Total drivers					960.00		
		Total deductions - Drivers					63.00		
		Total salary costs		Z$/month	28	3,200.00	17,260.00		
		Guard services	On site	Z$/month	2	450.00	900.00		
			Rapid response	Z$/month	1	69.00	69.00		
		Staff development	N/a	Z$/month	0	-	-		
		Compliance	Factory License	Unit	1	58.33	58.33		Z$700/year
			Agric Marketing Authority	Unit	1	83.33	83.33		Z$1,000/year
			NSS Inspection	Unit	1	10.00	10.00		Z$120/year
			EMA	Unit					Unknown
			Membership of Association	Unit	1	60.00	60.00		
			Medical checkup	Unit	23	50.00	1,150.00		Z$50/worker per year
		Energy	Electricity	Days	10000	0.12	1,200.00		10MgWh/month from Surrey
			Fuel for vehicle	Litres	5,036	1.27	6,395.36		
			Lubricants for vehicle	Litres	4	5.00	20.00		
		Water	Production	Litres	36,000	0.05	1,800.00		
			Cleaning	Litres	42,000	0.05	2,100.00		
		Maintenance	Vehicles	Lump sum	4	200.00	800.00		
			Plant	Lump sum	1	1,000.00	1,000.00		
		Dissinfectants and cleaning materials		Z$/month	1	200.00	200.00		
		Waste	Shrinkage	%	1	5,250.00	5,250.00		
			Condemned animals	Z$/month	1	350.00	350.00		
		Packaging	Boxes	Lump sum	1	500.00	500.00		
		Salt for hides		Z$/hide	1350.00	0.10			
		Land and building rental		Z$/m2	1,000	2.00	2,000.00		
		Mobile phone credit		Lump sum	1	100.00	100.00		
		Sub total variable costs					78,750.02		
	Capital equipment	Cooling equipment	Chiller	Unit	1	30,000.00	125.00		20
			Freezer/store	Unit	1	30,000.00	125.00		20
		Scales	Hanging scale	Unit	1	1,600.00	13.33		10
			Bulk weighing scale	Unit	1	800.00	6.67		10
			Small scale	Unit	1	400.00	3.33		10
		Tables	Stainless steel	Unit	4	200.00	3.33		20
		Hoses	Various	Lump sum	1	50.00	4.17		1
		Stunning devices	Captive bolt	Unit	1	2,000.00	33.33		5
		Cutting devices	Knives	Unit	4	50.00	16.67		1
			Saws	Unit	4	30.00	1.00		10 40' containers
		Clothing	Clothing set	Set	69	15.00	86.25		n/a 3 x a year
			Boots	Pair	69	23.00	132.25		n/a
		Equipment (office)	Set	Unit	5	2,000.00	83.33		10
		Equipment (vehicles)	7mt truck	Unit	1	75,000.00	625.00		10
			3.5mt truck	Unit	1	12,000.00	100.00		10
			5mt refrigerated truck	Unit	1	45,000.00	375.00		10
			2mt refrigerated truck	Unit	1	32,000.00	266.67		10
		Marketing and promotion		Lump sum	1	2,000.00	100.00		
		Taxes		Lump sum	1	25,000.00	2,083.33		Estimate
		Insurance		Lump sum	1	4,000.00	333.33		Estimate
		Finance costs							
		Sub total capital costs					4,186.17		
TOTAL COSTS							607,936.19		
Income	Sales	Meat - carcass		Z$	216	3,612.51	780,303.21		Wholesale
		Trimmings		Z$	14	800.00	11,520.00		
		Fat		Z$	14	1,000.00	14,400.00		
		5th Quarter		Z$	5	1,000.00	4,500.00		
		Hides		Z$	1,350	0.80	1,080.00		
		Manure		Z$	20	10.00	200.00		
		Stomach content for biodigesters		Z$	10	10.00	100.00		
TOTAL INCOME							812,103.21		
TOTAL PROFIT (after tax)							204,167.02		

TABLE 96: ABATTOIR - BUSINESS MODEL

Business parameters			Unit	Value	Notes
	Throughput	Purchases of carcasses per month	No.	40	Estimate
		Meat quantity per carcas	Kg	144	Estimate based on information from abattoirs
		Buying price	Z$/kg	3.5	Assume 'Economy' grade ex abattoir
		Selling price	Z$/kg	4.5	Guess. Assumes somewhere below retial butcher
		Total meat quantity per month	Kg		
		Percentage of throughput = beef products	%	30	Also selling fish, lamb and chicken Estimate
	Operating days per month		Day	22	
	Vehicle purchase price	Pick-up panel truck	Unit	20,000	
		Milage	Km/month	0	Assumes 60Km/day x number of carcasses
	Milage	Km/litre of diesel used	L/km	25	
		Engine oil price	Z$/L	5	
	Km/litre of diesel used	Diesel price	Z$/L	1.27	

TABLE 97: WHOLESALE - BUSINESS PARAMETER ASSUMPTIONS

		Item		Unit	No. of units	Average cost/unit	Total cost /month	Life	Notes
Inputs	Variable	Purchase of carcasses		Carcass	40	504.00	20,160.00		
		Sub total cost of purchases					20,160.00		
		Manager/cashier	Monthly costs (net)	Z$/month	1	700.00	700.00		Estimate
			Income tax	Z$/month	1	80.00			
			NSSA	Z$/month	1	21.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	21.00			
		Sales person	Monthly costs (net)	Z$/month	1	250.00	250.00		
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	7.50			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	7.50			
		Driver	Monthly costs (net)	Z$/month	1	250.00	250.00		
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	7.50			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	7.50			
		Drivers assistant	Monthly costs (net)	Z$/month	1	200.00	200.00		
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	6.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	6.00			
		Guard services		Z$/month	1	450.00	450.00		Contract
		Compliance	Trading license	Unit	1	250.00	20.83		
		Energy	Electricity	Days	22	5.00	110.00		Prepaid card
		Packaging	Bags	Lump sum	1	20.00	20.00		
		Land and building rental		Z$/month	1	300.00	300.00		Guess
		Card reader for epayment		Lump sum	1	40.00	40.00		Merchant charges
		Mobile phone credit		Lump sum	1	15.00	15.00		For card reader
		Sub total variable costs					1,655.83		
		Sub total variable costs by beef product throughput					496.75		Variable costs x % beef throughput
		Total labour tax				168.00			
	Capital equipment	Equipment (office)	Computer	Unit	1	300.00	1.25	20	
			Table/desk	Set	1	100.00	0.83	10	
			Mobile phone	Unit	1	20.00	0.33	5	
		Marketing and promotion		Lump sum	1	20.00	20.00		
		Taxes							None identified
		Insurance							None
		Finance costs							None
		Sub total capital costs					22.42		
		Sub total variable costs by beef product throughput					6.73		Capital costs x % beef throughput
TOTAL COSTS							20,663.48		
Income	Sales	Carcass		Z$	40	648.00	25,920.00		
TOTAL INCOME							25,920.00		
TOTAL PROFIT (after tax)							5,256.53		

TABLE 98: WHOLESALE - BUSINESS MODEL

Business parameters			Unit	Value	Notes
	Throughput	Purchases of carcasses per month	No.	9	Estimated as 2.5 x a retail butcher
		Carcas price	Z$	504	
		Meat quantity per carcas	Kg	144	Estimate based on information from abattoirs
		Percentage of throughput = beef products	%	30%	Percentage of total sales - guess
		Operational norms	Day	22	
		Buying price	Z$/kg	3.5	Assume 'Economy' grade ex abattoir
		Selling price	Z$/plate	2.5	Estimate based on discussion with African colleagues
		Beef per plate	Kg/plate	0.200	Mixed meat
		Beef as a proportion of the typical plate	%	40.00	Also maize porridge and relish
		Selling value of beef per plate	Z$/plate	1.00	
		Beef selling price per kg	Z$/kg	5	
		Plates sold per day	Plates	1,000.00	
		Beef plates sold per day	Plates	300.00	
		Beef sold per day	Kg	60	
		Beef sold per month	Kg	1320	
		Pick-up panel truck	Unit	20000	
		Milage	Km/month	550	Assumes 60Km/day x number of carcasses
		Km/litre of diesel used	L/km	25	
		Engine oil price	Z$/L	5	
		Diesel price	Z$/L	1.27	

TABLE 99: CATERING - BUSINESS PARAMETER ASSUMPTIONS

		Item		Unit	No. of units	Average cost/unit	Total cost /month	Life	Notes
Inputs	Variable	Purchase of carcasses		Carcass	9	504.00	4,620.00		
		Sub total cost of purchases					4,620.00		
		Manager	Monthly costs (net)	Z$/month	1	300.00	300.00		
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	9.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	9.00			
		Cashier	Monthly costs (net)	Z$/month	1	250.00	250.00		
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	7.50			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	7.50			
		Cooks	Monthly costs (net)	Z$/month	4	250.00	1,000.00		
			Income tax	Z$/month	4	-			
			NSSA	Z$/month	4	7.50			
			NEC contribution	Z$/month	4	1.00			
			Union fees	Z$/month	4	7.50			
		Waiters	Monthly costs (net)	Z$/month	4	250.00	1,000.00		
			Income tax	Z$/month	4	-			
			NSSA	Z$/month	4	7.50			
			NEC contribution	Z$/month	4	1.00			
			Union fees	Z$/month	4	7.50			
		Guard services		Z$/month	1	450.00	450.00		Contract
		Compliance	Trading license	Unit	1	250.00	20.83		Estimate
			Catering licence	Unit	1	250.00	20.83		Estimate
			Staff medicals	Unit	8	50.00	12.50		
		Energy	Electricity	Days	22	5.00	110.00		Prepaid card
			Gas for cooking	Lum sum	1	50.00	50.00		Estimate
			Fuel for vehicle	Litres	22	1.27	27.94		
			Lubricants for vehicle	Litres	1	5.00	5.00		
		Water	Potable	Days	22	5.00	110.00		
		Maintenance		Lump sum	1	20.00	20.00		
		Dissinfectants and cleaning materials		Z$/month	1	20.00	20.00		
		Waste	Cutting losses	%	1	5.00	66.00		
		Packaging	Take-away bags/boxes	Lump sum	1	20.00	20.00		
		Land and building rental		Z$/month	1	300.00	300.00		
		Card reader for epayment		Lump sum	1	40.00	40.00		Merchant charges
		Mobile phone credit		Lump sum	1	15.00	15.00		For card reader
		Sub total variable costs					3,838.10		
		Sub total variable costs by beef product throughput					1,151.43		Variable costs x % beef throughput
	Total labour tax					163.00			
	Capital equipment	Vehicle	Pick up	Unit	1	20,000.00	166.67	10	
		Equipment (office)	Computer	Unit	1	300.00	1.25	20	
			Table/desk	Set	1	100.00	0.83	10	
			Mobile phone	Unit	1	20.00	0.33	5	
		Restaurant equipment	Tables and chair sets	Unit	30	100.00	50.00	5	Set of table and 4 chairs
			Plates and cuttlery	Set	200	4.00	13.33	5	
			Serving counters	Unit	4	200.00	3.33	20	
		Marketing and promotion		Lump sum	1	20.00	20.00		
		Cooking equipment	Cookers	Unit	2	150.00	1.25	20	
			Knives and sundry cooking equipment	Lump sum	1	500.00	8.33	5	
		Uniforms		Lump sum	1	100.00	8.33	1	
		Taxes					-		None identified
		Insurance					-		None
		Finance costs					-		None
		Sub total capital costs					273.67		
		Sub total variable costs by beef product throughput					82.10		Capital costs x % beef throughput
TOTAL COSTS							5,853.53		
Income	Sales	Beef sold		Z$	1320	5.00	6,600.00		
TOTAL INCOME							6,600.00		
TOTAL PROFIT (after tax)							746.47		

TABLE 100: CATERING - BUSINESS MODEL

Business parameters			Unit	Value	Notes
	Throughput	Total turnover per month	Mt	120	
		Beef throughput	%	40	
	Operating days per month		Day	22	
	Vehicles	5mt refrigerated truck	Unit	45,000	
		2mt refrigerated truck	Unit	32,000	
	Input volume	Manufacturing	Mt	60	Assumes 80kg/day x 20 days
	Input price	Manufacturing beef ex abattoir	Z$/kg	1.80	
		Fat	Z$/kg	1.00	
		Trimmings	Z$/kg	0.80	
		Cases	Z$/kg	26.00	
		Spices	Z$/kg	5.20	
		Soya beans	Z$/kg	0.40	
	Sale price	Average processed meat	Z$/kg	4.00	
	Meat to processed meat ratio		A:B		
	Milage	5mt refrigerated truck	Km/month	13,200	Assumes 600km/day
		2mt refrigerated truck	Km/month	6,160	Assumes 280km/day
	Km/litre of diesel used	5mt refrigerated truck	L/Km	20	
		2mt refrigerated truck	L/Km	25	
	Engine oil price		Litres	5.00	
	Diesel price		Litres	1.27	
	Water		Z$/Litre	0.05	
	Water use	Production/day	Litres	1,200	
		Cleaning/day	Litres	1,400	
	Land rental price		Z$/m2	2.50	
	Water inclusion in processed meat	Meat etc %	%	75	
	Cost of finance		%	12	
	Waste	Shrinkage	%	1	Moisture loss

TABLE 101: MEAT PROCESSING - BUSINESS PARAMETER ASSUMPTIONS

		Item		Unit	No. of units	Average cost/unit	Total cost /month	Life	Notes
Inputs	Variable	Purchase of meat products							
		Manufacturing meat		Mt	60.00	1,800.00	108,000.00		
		Fat		Mt	12.00	1,000.00	12,000.00		
		Trimmings		Mt	24.00	800.00	19,200.00		
		Soya beans		Mt	4.80	400.00	1,920.00		
		Casings		Mt	0.95	16,473.60	15,656.51		Use 72kg/day
		Spices		Mt	1.58	3,294.72	5,218.84		Use 120kg/day
		Sub total cost of purchases					161,995.35		
		Sub total variable costs by beef throughput					64,798.14		
		Supervisor	Monthly salary (net)	Z$/month	1	700.00	700.00		Full time employee
			Income tax	Z$/month	1	80.00			
			NSSA	Z$/month	1	21.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	21.00			
		Manager	Monthly costs (net)	Z$/month	1	1,200.00	1,200.00		
			Income tax	Z$/month	1	180.00			
			NSSA	Z$/month	1	36.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	36.00			
		Workers	Monthly costs (net)	Z$/month	15	300.00	4,500.00		
			Income tax	Z$/month	15	-			
			NSSA	Z$/month	15	9.00			
			NEC contribution	Z$/month	15	1.00			
			Union fees	Z$/month	15	9.00			
		Marketing	Monthly costs (net)	Z$/month	2	500.00	1,000.00		
			Income tax	Z$/month	2	40.00			
			NSSA	Z$/month	2	15.00			
			NEC contribution	Z$/month	2	1.00			
			Union fees	Z$/month	2	15.00			
		Accountant	Monthly costs (net)	Z$/month	2	700.00	1,400.00		
			Income tax	Z$/month	2	80.00			
			NSSA	Z$/month	2	21.00			
			NEC contribution	Z$/month	2	1.00			
			Union fees	Z$/month	2	21.00			
		Driver	Monthly costs (net)	Z$/month	2	320.00	640.00		
			Income tax	Z$/month	2	4.00			
			NSSA	Z$/month	2	9.60			
			NEC contribution	Z$/month	2	1.00			
			Union fees	Z$/month	2	9.60			
		Guard services	On site	Z$/month	2	450.00	900.00		
			Rapid response	Z$/month	1	69.00	69.00		
		Staff development	N/a	Z$/month	0	-	-		
		Compliance	Factory License	Unit	1	700.00	58.33		Z$700/year
			Agric Marketing Authority	Unit	1	1,000.00	83.33		Z$1,000/year
			NSS Inspection	Unit	1	120.00	10.00		Z$120/year
			EMA	Unit					Unknown
			Membership of Association	Unit	1	60.00	60.00		
			Medical checkup	Unit	16	50.00	66.67		Z$50/worker per year
		Energy	Electricity	Days	22	80.00	1,760.00		Prepaid card
			Fuel for vehicle	Litres	906	1.27	1,151.13		
			Lubricants for vehicle	Litres	2	5.00	10.00		
		Water	Production	Litres	26,400	0.05	1,320.00		
			Cleaning	Litres	30,800	0.05	1,540.00		
		Maintenance		Lump sum	1	600.00	600.00		
		Dissinfectants and cleaning materials		Z$/month	1	110.00	110.00		
		Waste	Shrinkage	%	1	1,800.00	1,080.00		
		Packaging	Trays and bags	Lump sum	1	1,800.00	1,800.00		
		Land and building rental		Z$/m2	1,000	2.50	2,500.00		
		Mobile phone credit		Lump sum	1	50.00	50.00		
		Sub total variable costs					22,608.46		
		Sub total variable costs by beef throughput					9,043.38		Variable costs x % beef throughput
		Total deductions - tax				1,097.40			
	Capital equipment	Cooling equipment	Chillers/freezers	Unit	2	15,000.00	250.00	10	40' containers
		Sausage filler		Unit	1	60,000.00	500.00	10	Imported
		Processing	Knives	Unit	2	50.00	0.83	10	
		Clothing	Clothing set	Set	16	15.00	240.00	n/a	
			Boots	Pair	16	23.00	368.00	n/a	
		Equipment (office)	Set	Unit	1	2,000.00	16.67	10	
		Equipment (vehicles)	5mt truck	Unit	1	45,000.00	375.00	10	
			2mt truck	Unit	1	32,000.00	266.67	10	
		Marketing and promotion		Lump sum	1	500.00	100.00		
		Taxes							None identified
		Insurance							None
		Finance costs					7,775.78		Finance on local inputs
		Sub total capital costs					9,892.94		
		Sub total variable costs by beef throughput					3,957.18		Capital costs x % beef throughput
TOTAL COSTS							77,798.70		
Income	Sales	Processed meat sales		Mt	25	4,000.00	100,000.00		Wholesale
TOTAL INCOME							100,000.00		
TOTAL PROFIT (after tax)							22,201.30		

TABLE 102: MEAT PROCESSING - BUSINESS MODEL

Business parameters			Unit	Value	Notes
	Throughput	Total turnover per month	Kg		
		Percentage of throughput = beef products	%	40	Also selling fish, lamb and chicken
	Operating days per month		Day	24	
	No of trucks	Pick-up with panels	Unit	1	
	Input volume	Kg/month	Kg	1,920	Assumes 80kg/day x 24 days
	Input price	Economy beef ex abattoir	Kg	3.50	
	Sale price	Average economy beef	Kg	5.00	
	Pick-up cost	Pick-up with panels	Z$	20,000	Can carry 1mt
	Milage	No. of Km/month	Km	960	
	Km/litre of diesel used		Km	30	
	Engine oil price		Litres	5	
	Diesel price		Litres	1.27	
	Waste	Cutting losses	%	2	Loss of meat on cutting

TABLE 103: RETAIL BUTCHER - BUSINESS PARAMETER ASSUMPTIONS

		Item		Unit	No. of units	Average cost/unit	Total cost /month	Life	Notes
Inputs	Variable	Purchase of meat products							
		Economy meat carcass		Mt	1.92	3,500.00	6,720.00		
		Sub total cost of purchases					6,720.00		
		Blockman	Monthly salary (net)	Z$/month	1	250.00	250.00		Full time employee
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	7.50			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	7.50			
		Sales person	Monthly costs (net)	Z$/month	1	250.00	250.00		
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	7.50			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	7.50			
		Cashier	Monthly costs (net)	Z$/month	1	250.00	250.00		
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	7.50			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	7.50			
		Driver	Monthly costs (net)	Z$/month	1	200.00	200.00		
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	6.00			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	6.00			
		Guard services		Z$/month	0	-	-		None
		Staff development	N/a	Z$/month	0	-	-		
		Compliance	Trading license	Unit	1	250.00	20.83		
			Butchers license	Unit	1	250.00	20.83		
			Staff medicals	Unit	3	50.00	12.50		
		Energy	Electricity	Days	24	15.00	360.00		Prepaid card
			Fuel for vehicle	Litres	32	1.27	40.64		
			Lubricants for vehicle	Litres	1	5.00	5.00		
		Water	Potable	Days	24	15.00	360.00		
		Maintenance		Lump sum	1	100.00	100.00		
		Dissinfectants and cleaning materials		Z$/month	1	110.00	110.00		
		Waste	Cutting losses	%	2	3.50	134.40		
		Packaging	Trays and bags	Lump sum	1	120.00	120.00		Est.$30/week
		Land and building rental		Z$/month	1	600.00	600.00		
		Card reader for epayment		Lump sum	1	80.00	80.00		Merchant charges
		Mobile phone credit		Lump sum	1	15.00	15.00		For card reader
		Wood for Braai stand		Z$/day	1	1.50	36.00		
		Sub total variable costs					2,965.21		
		Sub total variable costs by beef throughput					1,186.08		Variable costs x % beef throughput
		Total deductions - labour tax				61.00			
	Capital equipment	Cooling equipment	Display chiller	Unit	1	2,000.00	16.67	10	
			Display freezer	Unit	1	2,400.00	20.00	10	
			Cold room	Unit	1	3,000.00	12.50	20	2.4m x 2.4m x 2m
			Deep freeze	Unit	1	1,000.00	8.33	10	
		Shop fittings	Stainless steel table	Unit	1	300.00	1.25	20	
			Bench saw	Unit	1	1,800.00	15.00	10	
			Cutting board	Unit	2	30.00	1.00	5	
			Stainless steel counter	Unit	1	200.00	0.83	20	
			Bulk weighting scale	Unit	1	800.00	3.33	20	
			Serving scale	Unit	2	400.00	6.67	10	
		Processing	Knives	Unit	2	50.00	0.83	10	
			Mincer	Unit	1	1,200.00	5.00	20	Toll mincing also common
		Clothing	Uniforms	Lump sum	1	90.00	7.50		
		Cooking	Braai stand	Unit	1	30.00	10.00	0.5	
		Equipment (office)	Safe	Unit	1	600.00	2.50	20	
			Computer	Unit	1	300.00	5.00	5	
			Table/desk	Set	1	100.00	0.83	10	
			Mobile phone	Unit	1	20.00	0.33	5	
		Equipment (vehicles)	Pick-up	Unit	1	20,000.00	166.67	10	
		Marketing and promotion		Lump sum	1	100.00	100.00		
		Taxes							None identified
		Insurance							None
		Finance costs							None
		Sub total capital costs					384.25		
		Sub total variable costs by beef throughput					153.70		Capital costs x % beef throughput
TOTAL COSTS							8,059.78		
Income	Sales	Economy beef		Z$	1881.6	5.00	9,408.00		Less cutting loss
TOTAL INCOME							9,408.00		
TOTAL PROFIT (after tax)							1,348.22		

TABLE 104: RETAIL BUTCHER - BUSINESS MODEL

Business parameters			Unit	Value	Notes
	Throughput	Total turnover per month	Head	4	
		Percentage of throughput = beef products	%	60	Also selling lamb, goat and chicken
	Operating days per month		Day	22	
	Cattle throughput per day		Head	0.18	
	Average animal weight on arrival		Kg	320.00	
	Input volume	Kg/month	Kg	1,280.00	
	Input price	Average buying price	Z$/Head	450.00	
	Outputs ratios	Meat cuts mixed (including fat)	%	43.00	
		Organs	%	15.00	
		Viscera (lites, tripes)	%	15.00	
		Head	%	5.00	
		Feet	%	2.00	
		Hide	%	5.00	
		Blood		15.00	Waste
		Total	%	100.00	
	Output volume per head	Meat cuts mixed (including fat)	Kg	137.60	
		Organs	Kg	48.00	
		Viscera (lites, tripes)	Kg	48.00	
		Head	Kg	16.00	
		Feet	Kg	6.40	
		Hide	Kg	16.00	
		Blood	Kg	0.00	
		Total	Kg	320.00	
	Retail prices	Meat cuts mixed (including fat)	Z$/kg	4.00	
		Organs	Z$/kg	2.50	
		Viscera (lites, tripes)	Z$/kg	2.50	
		Head	Z$/kg	0.90	
		Feet	Z$/kg	4.00	
		Hide	Z$/kg	0.00	
		Blood	Z$/kg	-	
	Waste	Cutting losses	%	1	Loss of meat on cutting

TABLE 105: RURAL BUTCHER - BUSINESS PARAMETER ASSUMPTIONS

		Item		Unit	No. of units	Average cost/unit	Total cost /month	Life	Notes
Inputs	Variable	Purchase of meat products	Live animals from farmers	Head	4	450.00	1,800.00		
		Sub total cost of purchases					1,800.00		
		Blockman	Monthly salary (net)	Z$/month	1	250.00	250.00		Full time employee
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	7.50			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	-			
		Assistant	Monthly costs (net)	Z$/month	1	250.00	250.00		
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	7.50			
			NEC contribution	Z$/month	1	1.00			
			Union fees	Z$/month	1	-			
		Compliance	Trading license	Unit	1	250.00	20.83		
			Butchers license	Unit	1	250.00	20.83		
			Staff medicals	Unit	3	50.00	12.50		
		Water	Potable	Days	22	10.00	220.00		
		Maintenance		Lump sum	1	50.00	50.00		
		Dissinfectants and cleaning materials		Z$/month	1	10.00	10.00		
		Waste	Cutting losses	%	1	4.00	12.80		
		Packaging	Trays and bags	Lump sum	1	10.00	10.00		
		Land and building rental		Z$/month	1	660.00	660.00		
		Card reader for epayment		Lump sum	1	20.00	20.00		
		Mobile phone credit		Lump sum	1	5.00	5.00		For card reader
		Sub total variable costs					1,541.97		
		Sub total variable costs by beef throughput					925.18		Variable costs x % beef throughput
		Sub total labour tax				17.00			
	Capital equipment	Cooling equipment	Deep freeze	Unit	1	1,000.00	4.17	20	
		Equipment (vehicles)	Pick-up	Unit	1	-	-	10	
		Shop fittings	Table	Unit	1	30.00	0.13	20	
			Cutting block	Unit	1	10.00	0.17	5	
		Processing	Knives	Unit	2	30.00	0.50	10	
			Saw	Unit	1	10.00	0.83	5	
		Equipment (office)	Mobile phone	Unit	1	20.00	0.33	5	
		Marketing and promotion		Lump sum	1	100.00	100.00		
		Taxes							None identified
		Insurance							None
		Finance costs							None
		Sub total capital costs					106.13		
		Sub total variable costs by beef throughput					63.68		Capital costs x % beef throughput
TOTAL COSTS							2,788.86		
Income	Sales	Meat and meat cuts	Meat cuts mixed (including fat)	Z$	550.40	4.00	2,201.60		Less cutting loss
			Organs	Z$	192.00	2.50	480.00		
			Viscera (lites, tripes)	Z$	192.00	2.50	480.00		
			Head	Z$	64.00	0.90	57.60		
			Feet	Z$	25.60	4.00	102.40		
			Hide	Z$	64.00	-	-		
			Blood	Z$	-	-	-		
TOTAL INCOME							3,321.60		
TOTAL PROFIT (after tax)							532.75		

TABLE 106: RURAL BUTCHER - BUSINESS MODEL

Business parameters			Unit	Value	Notes
	Throughput	Total turnover per month	Tray	22	Assumes 1 tray a day
		Kg/load	Kg	20	Estimate
		Percentage of throughput = beef products	%	20	Also selling lamb, goat and chicken
	Operating days per month		Day	22	
	Input volume	Kg/month	Kg	440.00	Assumes 80kg/day x 24 days
	Input price	Average buying price	Z$/Kg	5.00	Estimate
	Retail prices	Mixed meat/offal packs	Z$	8.00	Estimate
	Waste	Cutting losses	%	1	Loss of meat on cutting

TABLE 107: INFORMAL RETAIL - BUSINESS PARAMETER ASSUMPTIONS

		Item		Unit	No. of units	Average cost/unit	Total cost /month	Life	Notes
Inputs	Variable	Purchase of meat	Fresh from retail butcher or wholesaler	Kg	88	5.00	440.00		
		Sub total cost of purchases					440.00		
	Labour	Sales	Monthly salary (net)	Z$/month	0	250.00	-		Own labour
			Income tax	Z$/month	1	-			
			NSSA	Z$/month	1	-			
			NEC contribution	Z$/month	1	-			
			Union fees	Z$/month	1	-			
		Compliance	Trading license	Unit	1	-	-		Currently illegal
		Waste	Cutting losses	%	1	8.00	4.40		
		Packaging	Trays and bags	Lump sum	1	20.00	20.00		
		Travel costs	Bus fares	Z$/month	22	0.50	11.00		
		Sub total variable costs					35.40		
		Sub total variable costs by beef throughput					7.08		Variable costs x % beef throughput
		Sub total labour tax				-			
	Capital equipment	Processing	Knives	Unit	1	10.00	0.42	2	
		Taxes							None identified
		Insurance							None
		Finance costs							None
		Sub total capital costs					0.42		
		Sub total variable costs by beef throughput					0.08		Capital costs x % beef throughput
TOTAL COSTS							447.16		
Income	Sales	Meat and meat cuts	Mixed 'bags' of meat and offal'	Z$	88.00	8.00	704.00		Less cutting loss
TOTAL INCOME							704.00		
TOTAL PROFIT (after tax)							256.84		

TABLE 108: INFORMAL RETAIL - BUSINESS MODEL

Operation	Final output	Product sold in sector	Subsidy	Consumable off sector	Consumable in sector	Service	Salary	Taxes	Financial costs	Annuity	Amortization	Net Operating Surplus
PFC	12 222 000	113 778 000	0	32 709 600	0	1 440 000	0	14 400 000	0	0.00	1 440 000	76 010 400
PCOM	1 716 000	12 584 000	0	4 223 337	0	1 857 227	2 925 000	698 455	0	0.00	304 180	4 291 802
PPCOT	25 272 000	39 528 000	0	17 923 160	0	6 398 844	0	1 170 520	0	0.00	1 912 630	37 394 840
PPCTR	0	11 610 000	0	4 398 166	0	1 570 213	0	287 234	0	0.00	469 340	4 885 047
PFCTR	0	12 040 000	0	3 634 400	0	160 000	0	1 600 000	0	0.00	160 000	6 485 600
CFCS	0	33 000 000	0	0	27 500 000	3 369 307	1 193 576	149 595	0	0.00	2 246	785 277
TFCRB	107 848 100	0	0	5 165 016	41 580 000	16 031 040	9 745 313	1 143 450	0	0.00	106 386	34 076 930
TPCRB	8 403 751	0	0	402 469	3 888 001	1 249 172	759 375	65 433	0	0.00	8 290	2 031 012
TCPCT	18 856 400	79 827 640	0	1 249 564	60 833 040	583 889	1 925 218	367 805	0	0.00	187 384	33 537 140
TCom	3 772 679	15 971 450	0	250 006	11 156 860	116 821	385 186	73 588	0	0.00	37 491	7 724 178
TCFC	23 745 850	100 526 900	0	1 573 575	63 839 160	735 291	2 424 425	463 176	0	0.00	235 972	55 001 120
CM	159 500 800	21 750 110	0	7 438 184	129 575 100	4 780 783	6 228 091	539 896	0	0.00	1 921 067	30 767 780
CSMCat	83 915 320	11 443 000	0	1 496 471	66 750 820	1 683 255	11 052 900	463 174	0	0.00	850 712	13 060 990
TPCM	73 098	159 413	0	7 366	235 440	2 361	7 893	1 908	0	0.00	725	-23 183
TCMM	14 530	31 688	0	1 464	46 800	469	1 569	379	0	0.00	144	-4 608
TFCM	95 765	208 845	0	9 651	308 448	3 093	10 341	2 499	0	0.00	950	-30 372
TPM	0	370 319	0	89 038	159 978	7 538	15 419	202	19 917	0.00	1 879	76 349
CMI	52 577 880	0	0	256 492	33 193 110	141 071	0	0	0	0.00	64 123	18 923 090
CSPMCat	92 580	0	0	1 124	74 064	1 256	8 332	333	0	0.00	545	6 926
CPM	92 580	0	0	4 244	74 064	2 772	3 518	2 030	0	0.00	827	5 124
CPMI	277 740	0	0	2 666	222 192	1 466	0	0	0	0.00	667	50 749
Consolidated accounts of the sector												
	498 477 073--------		**0**	**80835994--------**		**40135869**	**36686156**	**21429678**	**19917**	**0.00**	**7705558**	**325056190**

TABLE 109: CONSOLIDATED/AGGREGATED ACCOUNT OF WHOLE VC BY OPERATION

VALUES

Agent	Final output	Product sold in sector	Subsidy	Consumable off sector	Consumable in sector	Service	Salary	Taxes	Financial costs	Amortization	Net Operating Surplus	Total output	Capacité	Nbr of Agent
Fully Communal farmer	**12222000**	**125818000**	**0**	**36344000**	**0**	**1600000**	**0**	**0**	**16000000**	**1600000**	**82496000**	**140000**	**0**	**80000**
Partially Communal farmer	**25272000**	**51138000**	**0**	**22321326**	**0**	**7969057**	**0**	**0**	**1457754**	**2381970**	**42279887**	**92978**	**4**	**2637**
Commercial farmer	**1716000**	**12584000**	**0**	**4223337**	**0**	**1857227**	**2925000**	**0**	**698455**	**304180**	**4291802**	**22364**	**88**	**25**
Rural butcher	**116251851**	**0**	**0**	**5567485**	**45468001**	**17280212**	**10504688**	**0**	**1208883**	**114676**	**36107942**	**44820**	**18**	**249**
Trader	**0**	**33000000**	**0**	**0**	**27500000**	**3369307**	**1193576**	**0**	**149595**	**2246**	**785277**	**27500**	**455**	**6**
Abbatoir	**46558323**	**196725935**	**0**	**3091626**	**136419748**	**1441925**	**4754632**	**0**	**909356**	**462667**	**96204273**	**140838**	**5 760**	**2**
Retail butcher	**159593380**	**21750110**	**0**	**7442428**	**129649164**	**4783555**	**6231609**	**0**	**541926**	**1921894**	**30772904**	**37021**	**23**	**160**
Informal retail	**52855620**	**0**	**0**	**259159**	**33415302**	**142537**	**0**	**0**	**0**	**64790**	**18973839**	**6639**	**1**	**628**
Catering	**84007900**	**11443000**	**0**	**1497595**	**66824884**	**1684511**	**11061232**	**0**	**463507**	**851257**	**13067916**	**19072**	**16**	**122**
Consolidated accounts of the sector : Beef Zimbabwe														
	498477073	**452459045**	**0**	**80746955**	**439277098**	**40128331**	**36670737**	**0**	**21429475**	**7703680**	**324979841**			

TABLE 110: CONSOLIDATED/AGGREGATED ACCOUNT OF THE WHOLE VC BY AGENT

ACCOUNTING AGREGATS AND PERFORMANCE RATIOS

Operation	Total gross product	Total Intermediate consumption	Value added (VA)	Subsidy rate	CI en filière / CIT	VA / Output	Salary / VA	Financial costs / VA	Taxes / VA	Amortization/ VA	Net Operating Surplus/ VA	Net Operating Surplus / Load
PFC	126 000 000	34 149 600	91 850 400	0%	0%	73%	0%	0%	16%	2%	83%	152%
PCOM	14 300 000	6 080 564	8 219 436	0%	0%	57%	36%	0%	8%	4%	52%	43%
PPCOT	64 800 000	24 322 010	40 477 990	0%	0%	62%	0%	0%	3%	5%	92%	136%
PPCTR	11 610 000	5 968 379	5 641 621	0%	0%	49%	0%	0%	5%	8%	87%	73%
PFCTR	12 040 000	3 794 400	8 245 600	0%	0%	68%	0%	0%	19%	2%	79%	117%
CFCS	33 000 000	30 869 310	2 130 690	0%	89%	6%	56%	0%	7%	0%	37%	2%
TFCRB	107 848 100	62 776 060	45 072 040	0%	66%	42%	22%	0%	3%	0%	76%	46%
TPCRB	8 403 751	5 539 642	2 864 109	0%	70%	34%	27%	0%	2%	0%	71%	32%
TCPCT	98 684 040	62 666 500	36 017 540	0%	97%	36%	5%	0%	1%	1%	93%	51%
TCom	19 744 130	11 523 690	8 220 440	0%	97%	42%	5%	0%	1%	0%	94%	64%
TCFC	124 272 700	66 148 030	58 124 670	0%	97%	47%	4%	0%	1%	0%	95%	79%
CM	181 250 900	141 794 100	39 456 800	0%	91%	22%	16%	0%	1%	5%	78%	20%
CSMCat	95 358 320	69 930 550	25 427 770	0%	95%	27%	43%	0%	2%	3%	51%	16%
TPCM	232 511	245 167	-12 657	0%	96%	-5%	-62%	0%	-15%	-6%	183%	-9%
TCMM	46 218	48 734	-2 516	0%	96%	-5%	-62%	0%	-15%	-6%	183%	-9%
TFCM	304 610	321 192	-16 581	0%	96%	-5%	-62%	0%	-15%	-6%	183%	-9%
TPM	370 319	256 554	113 765	0%	62%	31%	14%	18%	0%	2%	67%	26%
CMI	52 577 880	33 590 670	18 987 210	0%	99%	36%	0%	0%	0%	0%	100%	56%
CSPMCat	92 580	76 443	16 136	0%	97%	17%	52%	0%	2%	3%	43%	8%
CPM	92 580	81 080	11 500	0%	91%	12%	31%	0%	18%	7%	45%	6%
CPMI	277 740	226 324	51 415	0%	98%	19%	0%	0%	0%	1%	99%	22%
Consolidated accounts of the sector												
Sector	**944157777**	**241529862**	**417641079**	**0.00**		**84%**	**9%**	**0%**	**5%**	**2%**	**78%**	**174%**

TABLE 111: CONSOLIDATED/AGGREGATED ACCOUNT OF THE WHOLE VC WITH PERFORMANCE RATIOS

Annex 6: Table of AFA value chain flow proportions

			SELLER																			
			FARMERS					RURAL BUTCHER		ABATTOIR						MEAT PROC.	TRADER	RETAIL BUTCHER		INFORMAL RETAIL		CATERING	
			PFC	PFCTR	PPCOT	PPCTR	PCOM	TFCRB	TPCRB	TCPCT	TCom	TCFC	TPCM	TCMM	TFCM	TPM	CFCS	CPM	CM	CMI	CPMI	CSMCat	CSPMCat
BUYER	FARMERS	PFC																					
		PFCTR																					
		PPCOT																					
		PPCTR																					
		PCOM																					
	RUR. BUT.	TFCRB	33%																				
		TPCRB			6%																		
	ABATTOIR	TCPCT			52%												94%						
		TCom					83%																
		TCFC	53.9 %																				
		TPCM			3%												6%						
		TCMM					5%																
		TFCM	3.4%																				
	MEAT PROC.	TPM											100 %	100%	100 %								
	TRADER	CFCS		100 %		100%																	
	RET. BUT.	CPM														20%							
		CM								66%	66%	66%											
	INF. RET.	CMI																					
		CPMI														60%							
	CAT	CSMCat								34%	34%	34%											
		CSPMCat														20%							
	END US	USCPC			25%																		
		PCA	9.3%				2%																
		USCCO					10%																
		COMA	0.4%		14%																		
		UCM																100 %	100 %	100 %	100 %	100%	100%

	E	UCMR						100 %	100%													

Annex 7: List of macroeconomic data sources used during the AFA analysis

Variable	Value	Data source
Total exports	Z$2,832 million	World Bank, 2016. World Integrated Trade Solution (WITS), retrieved from https://wits.worldbank.org/
Agricultural exports	Z$1,100 million	USDA 2015. Zimbabwe Agricultural Economic Fact Sheet, GAIN reports, retrieved from https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Zimbabwe%20Agricultural%20Economic%20Fact%20Sheet_Pretoria_Zimbabwe_9-22-2015.pdf
Total imports	Z$5,212 million	World Bank, 2016. World Integrated Trade Solution (WITS), retrieved from https://wits.worldbank.org/
Agricultural imports	Z$1,000 million	USDA 2015. Zimbabwe Agricultural Economic Fact Sheet, GAIN reports, retrieved from https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Zimbabwe%20Agricultural%20Economic%20Fact%20Sheet_Pretoria_Zimbabwe_9-22-2015.pdf
GDP	Z$16,289 million	World Bank, 2016. World Integrated Trade Solution (WITS), retrieved from https://wits.worldbank.org/
Agricultural GDP	Z$1,600 million	USDA 2015. Zimbabwe Agricultural Economic Fact Sheet, GAIN reports, retrieved from https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Zimbabwe%20Agricultural%20Economic%20Fact%20Sheet_Pretoria_Zimbabwe_9-22-2015.pdf
Total government earnings	Z$4,000 million	International Monetary Fund, 2016. General Government Revenue for Zimbabwe, retrieved from https://fred.stlouisfed.org/series/ZWEGGRG01GDPPT
Gross national income	Z$1,500 million	World Bank, 2016. World Bank Open Data, retrieved from https://data.worldbank.org/indicator/NY.GNP.ATLS.CD?locations=ZW
Total national wages	Z$7,000 million	Zimbabwe National Statistical Agency, 2016. Facts and figures, retrieved from http://www.zimstat.co.zw/sites/default/files/img/publications/Fact_Figures%20_2016.pdf
Inflation rate	9.5% (Used to calculate real wage rate)	International Monetary Fund, 2018. IMF Data Mapper, retrieved from http://www.imf.org/external/datamapper/PCPIPCH@WEO/OEMDC/ZWE
Nominal interest rate	9.3%	Reserve Bank of Zimbabwe, 2018, retrieved from https://tradingeconomics.com/zimbabwe/interest-rate

Real interest rate	Inflation rate: 9.5% Real interest rate: 0%	International Monetary Fund, 2018. IMF Data Mapper, retrieved from http://www.imf.org/external/datamapper/PCPIPCH@WEO/OEMDC/ZWE

Annex 8 Main indicators used in the Economic Analysis

Financial Analysis

Net income by actor	Production - costs
Return on turnover	Net income / sales
Benefit/cost ratio	Net income/ total costs

Effects within the national economy

Value added	Production – intermediate goods and services (IGS)
Total value added	Value added generated by the actors operating within the VC + VA that results from activities induced by the use of IGS supplied by actors outside the VC limits (backward linkages comutation)
Total imports	Imports generated by the actors operating within the VC + imports that result from activities induced by the use of IGS supplied by actors outside the VC limits (backward linkages comutation)
Value added share of the GDP	Total value added / GDP
Value added share of the agricultural GDP	Total value added / agricultural GDP
Public funds balance	Taxes – Subsideies + operating profits of public enterprises + receipts – outlays of the government budget
VC balance of trade	Exports – Total imports – imports of IGS
Rate of importation	Total imports/VC production
Rate of integration into the economy	Total VA/VC production

Sustainability and vibility within the global economy

Nominal Protection Coefficient (NPC)	Production at market gate / Production at international price

	Measures the impact of policies on the price of the output
Domestic Resource Cost Ratio (DRC)	Non tradeable domestic factors at market price (without transfers) / Production at international price – Tradeable goods and services at international prices Measures the overall economic gain or loss for the national economy. Gives an indication of the international competitiveness of the VC

Growth inclusiveness

Share (%) final price at farm gate	Price at farm gate / Final price